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Phyſical Experiments

UPON

BRUTES.

BOOKS Printed for C. HITCH, at the *Red-Lion* in *Pater-Noſter-Row.*

THE Modern Theory and Practice of Phyſic: Wherein the Antecedent Cauſes of Diſeaſes; the Riſe of the moſt uſual Symptoms incident to them; and the true Methods of Cure, are explained according to the eſtabliſhed Laws of Nature, and thoſe of the Animal Oeconomy. Together with a Chemical Analyſis of the Urine, and a Statical Examination of the Blood, in every Stage of each Diſtemper where Blood could be drawn with Safety.

2. A New Eſſay on Muſcular Motion, founded on Experiments, Obſervations, and the Newtonian Philoſophy. Price 2 s.

Both by BROWNE LANGRISH, of the College of Phyſicians, *London*; and F. R. S.

7725

Phyſical Experiments

UPON

BRUTES:

In Order to diſcover a Safe, and Eaſy
METHOD of diſſolving the STONE in the
BLADDER, by INJECTIONS.

To which is added,

A COURSE of EXPERIMENTS with the
LAURO-CERASUS; in Order to inveſtigate
its Effects on Animal Bodies, when given in ſuch
ſmall Doſes as not to kill.

LIKEWISE,

An ACCOUNT of ſeveral EXPERIMENTS and
OBSERVATIONS on the FUMES of SULPHUR; ſhewing by what Means they deſtroy
an Animal Body.

Which were read before the ROYAL SOCIETY,
at Several of their Meetings,
By *BROWNE LANGRISH*,
Of the College of PHYSICIANS, *London*, and
Fellow of the ROYAL SOCIETY.

LONDON:
Printed for C. HITCH, at the *Red-Lyon*, in *Pater-Noſter-Row*. MDCCXLVI.

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TO

Martin Folkes, Eſq;
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OF THE

ROYAL SOCIETY of *London*,

FOR

Improving NATURAL KNOWLEDGE,

Theſe Three Courſes of PHYSICAL EXPERIMENTS upon BRUTES are humbly Dedicated by

Their moſt obedient

Humble Servant

Browne Langriſh.

PREFACE.

BEING fully perſuaded of the great Advantages that would accrue from a ſteady and diligent Enquiry into the Nature and Properties of ſuch Things as the following Experiments lead us to, is the Reaſon of their Publication; in Hopes to excite others of better Abilities to ſtrike into this Method of Inveſtigation, whereby many grand and uſeful Diſcoveries might certainly be made.

The following Experiments upon the Bladders of Dogs, do undoubtedly ſhew us how ſtrong a Menſtruum they are able to bear, without injur-

ing the Fibres; and though the ſeveral Menſtrua which I have found to ſit eaſy in their Bladders, may not be ſufficient to diſſolve any other but very ſoft Stones, were they to be injected into the Bladders of Men, even for a long Time, yet ſurely the Enquiry is worthy of being purſued, in order to find out more effectual Solvents, and a better Method of conveying them into the Bladder.

The great Misfortune is, that Men of Learning and Experience are generally too much engaged in the World to ſpend their Time after ſuch Reſearches as theſe, which are not likely to turn to immediate Profit, though, perhaps, the greateſt Good to Mankind in general, may flow from them hereafter.

Lord Verulam *in his* New Atlantis, *or Plan of a Society for the Promotion of Knowledge, propoſes trying Poiſons and other Medicines on Beaſts; as well with Regard to Chirurgery as Phyſic. By theſe Means, he ſays, we may become Maſters of many ſtrange Effects; ſuch as the continuing of Life, tho' ſeveral Parts, which you account vital, be periſhed, and cut away; the recovering of ſome Creatures after they ſeem dead, and the like.*

'Tis pity therefore but ſome ſuitable Encouragement ſhould be given to three or four proper Perſons, who ſhould be appointed by the College *of* Phyſicians, *or by the* Council *of the* Royal Society, *to make ſuch Experiments as ſhould be thought moſt likely to improve the Medical Art, and to publiſh them annually. I*

believe every one will join in Opinion with me that ſuch an Inſtitution would be of infinite Uſe, eſpecially if a ſufficient Number of Convicts were to be allowed them, by Law, to make the Experiments upon.

It is to be taken for granted that ſuch Gentlemen as would be appointed for Experimentors, would be humane, charitable and good-natured; ſo that no Hardſhip would be put upon the Subjects under their Care, no ſuch Experiments made, as would put them to unneceſſary Pain, or endanger their Lives: Whence it is natural to think that every Convict would gladly embrace ſuch Terms, rather than ſuffer Death, or even Tranſportation.

But to proceed: I am aware of ſeveral Objections which may be made againſt

againſt the Method I have propoſed for diſſolving the Stone in the Bladder, by Injections.

As firſt, *That paſſing the Catheter ſo often into the Bladder, may inflame the Urethra and Sphincter.*

Secondly, *The Bladder and Sphincter are very often wounded by the Fretting of the Stone; at which Time it would be improper to inject any acrid, corroſive Menſtruum.*

Thirdly, *The Bladder may not be able to bear a ſtronger Menſtruum than the Urine may be made by taking Medicines at the Mouth, which we often find to create ſuch Pains as oblige the Patient to deſiſt from taking them.*

As to the firſt Objection, I muſt confeſs I have not been converſant enough in the Practice of paſſing the Catheter into the Bladders of Men, to be a ſufficient Judge of it, and therefore very readily ſubmit it to ſuch Gentlemen as have been moſt experienced in that Art.

I have indeed entertained ſome Thoughts that Liquors might be propelled into the Bladder with Safety, though the Catheter ſhould not be introduced above half the Length of the Urethra; but I am told that the Menſtruum would force itſelf into ſome of the excretory Ducts which open into the Urethra, and more eſpecially into thoſe of the Veſiculæ ſeminales, *before the Sphincter of the Bladder would yield and open itſelf; by which Means much Miſchief would enſue.*

Quære, *Whether ſheathing a Catheter with the Ureter of a Sheep, or with an Artery, or a Vein, and ſoaking it in warm Barley Water, juſt before it is to be introduced, would not give it a fine Degree of Lubricity, and make it paſs more eaſily?*

If this ſhould not do, I hope ſome Means might be found out of conveying a Menſtruum into the Bladder without injuring the Urethra, or Sphincter, provided it be thought neceſſary and uſeful to put ſuch Things in Practice as the following Experiments lead us to.

In Women, where the Urethra is ſhort and ſtrait, I am aſſured the Catheter may be paſſed into the Bladder with very little or no Pain; ſo that the Objection ceaſes in Regard to them.

As to the ſecond Objection, it is moſt certain that if the Bladder or Sphincter be already hurt by the Weight, or ſharp Points of the Stone; if Blood is voided with the Urine, and we have Reaſon to think it comes from any ruptur'd Veſſel in the Bladder; or if there be any Suſpicion of an Ulcer, we muſt not, in ſuch Caſes, venture to inject the leaſt Quantity of Soap-lees, or any ſuch corroſive Menſtruum. But even then, I am well aſſured we might ſafely make Uſe of Lime-Water, which is well known to cleanſe Excoriations and Ulcers, and diſpoſe them to heal up. It is alſo a gentle Reſtringent; and further, I have always obſerved that in digeſting Calculi in Stone Lime-water, or in Oyſter-ſhell Lime-water, they have been covered over in a few Days, with calcarious Matter, and the diſſolved Parts of the

the Calculi, to a conſiderable Thickneſs, which muſt of Courſe give Eaſe from its Softneſs, and will prevent any further Eroſions of the Bladder by Reaſon the Spiculæ or ſharp Points of the Stone will be worn off, or ſheathed over.

Thirdly, *In Regard to the Urine being poſſibly endued with a lythontriptic Virtue, equal to ſuch Menſtruums as may be injected into the Bladder with Safety, the Proof of that muſt depend upon a proper Number of Experiments made by digeſting Calculi in each Sort.*

I very well know that the taking large Quantities of Soap-lees, or Stone, or Oyſter-ſhell Lime have brought on Pains in the Urinary Paſſages, and at laſt have ſtung the Parts ſo much as to oblige the Patient

Patient to deſiſt from taking them. But then I never could learn that the Urine of ſuch Perſons had a ſolvent Power equal to many of the Injections hereafter mentioned, which always inclined me to think that ſome other Kind of Salts in the Blood were attracted by, and detached off through the Kidnies, along with the Potaſh Salts, and fiery Particles of the Lime, ſo as to occaſion the Dyſuria; ſince it is common for that Complaint to proceed from the Urine being too much loaded with Salts when no Sort of Medicines have been taken.

I would not by this be underſtood to exclaim againſt taking Medicines by the Mouth, in Order to diſſolve the Stone in the Bladder. On the contrary, I think it would be highly neceſſary ſo to do, if the Injections here propoſed, were to be put into Practice, with a View to prevent the Urine from weakening the Virtue of the Menſtruum ſo much as it would otherwiſe do; by which Means, even in the Intervals, when the Injections are diſcharged, the Urine will continue to forward the Cure in the ſame Manner as if no Injections were made.

In ſhort, I propoſe this Method only as an Auxiliary; and even as ſuch, I would not have it ventured upon without a great many previous Tryals upon Convicts.

I don't pretend to affirm that the Menſtrua which I have found to ſit eaſy in the Bladders of Dogs, will certainly do ſo in Men, though I know no Reaſon to the contrary; or that they will be ſufficient of them-

ſelves to diſſolve large and hard Stones; but this I am fully convinced of, that no Liquor will give more Pain to the Bladder, from its acrid, corroſive Quality, by being injected in our Way, than if it deſcended from the Kidnies; ſo that whatever Degree of Strength the Urine may be proved to be ſaturated with by taking Medicines at the Mouth, and yet does not injure the Bladder, the ſame Degree of Strength (and perhaps a much greater, by the Menſtruum being free from all Foreign Mixture) we may venture to inject without any Danger of wounding the Fibres. Even this may be of great Uſe to ſuch Conſtitutions as cannot bear to take large Quantities of Soap, &c.

Hence if we could be ſo happy as to find out a Way of conveying a Men-

a Menſtruum into the Bladder, without much Pain or Trouble, and that as often as we pleaſe, I hope we ſhould be able diſcover ſuch Solvents as would greatly conduce towards diſſolving the Stone, without producing any ill Effect.

The Experiments with the Lauro-Ceraſus *open a large Field to our View; it is no leſs than to enquire after, and find out the Phyſical Virtues of every Plant, Root and Tree, whoſe Properties we are as yet unacquainted with. There cannot be any Bounds ſet to ſuch Reſearches as theſe; every Courſe of Experiments will diſcover ſomething Capital, 'till ſpecific Remedies are found out for almoſt every Diſeaſe.*

Hitherto the Diſcovery of the good or bad Effects of moſt Drugs ſeems

ſeems to be owing to Chance. We are told [*] *when the* Indians *are cured by any Herb, they bring Part thereof, and offer it to their God; whereby the Remembrance of this Herb and its Virtue is not only preſerved, but the Prieſt, who is alſo their Phyſician, becomes better inſtructed thereby, and knowing in the Art of Medicine.*

The Virtue of the Peruvian *Bark, in curing Agues, might probably be diſcovered in this Manner; and indeed its other moſt excellent Property of curing Mortifications, I believe was not found out by reaſoning* à priori.

A long Series therefore of Experiments of this Kind, firſt upon

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[*] *Phil. Tranſ.* No. 454.

Brutes, and afterwards upon Men, is the only Means whereby we can reaſonably hope to attain to the Knowledge of the ſpecific Virtue of ſuch Plants, &c. *as have never yet been uſed in Medicine; and I make no Doubt but if proper Encouragement was given, great Advantages would, in Time, derive to the Medical Art, ſince, by uſing ſimple Medicines we certainly ſhould know what it is that effects the Cure.*

As to the Courſe of Experiments with the Fumes of burning Sulphur, it is more a Philoſophical than a Medical Enquiry. I did not know before I began it, but that the ſulphureous Fumes might intercept and arreſt the Animal Spirits, ſomething like what many Things do the electrical Effluvia; and thereby I was in *in Hopes of receiving ſome Light towards the Cauſe of Muſcular Motion. But it plainly appears from every Experiment, that the Fumes have no ſenſible Effect on the Animal Spirits, neither do they kill, when inſpired into the Lungs by any immediate Action of their own on the Blood and Juices, or on any Part of the vaſcular Syſtem; but their malignant Influence is on the moſt ſubtile, ætherial Fluid in the Air, without which an Animal cannot live.*

Phy-

Phyſical Experiments

UPON

BRUTES:

In Order to diſcover a ſafe and eaſy Method of diſſolving the Stone in the Bladder by

INJECTIONS.

Phyſical Experiments

UPON

BRUTES.

EVER ſince Mrs. *Stephens* diſcovered her Medicine for diſſolving the Stone, I have been of Opinion that Lime-Water, Soap, or Soap-Lees might be mixed with ſome proper mucilaginous Liquor, and injected immediately into the Bladder, without doing any Injury to its Fibres; and if ſo, the Advantages would inconteſtably be very great, ſince the whole diſſolving Power would have its full Force on the Stone, without being diluted, or altered ſo much as it muſt needs be in the Courſe of the Circulation.

This I have often talked of to my learned and ingenious Friend the Rev. Dr. *Hales*, who always gave me great Encouragement to make ſome Trials towards it; and indeed the Experiments which he has already publiſhed, together with Dr. *Jurin*'s, Dr. *Rutty*'s, Dr. *Hartley*'s, Dr. *Whytt*'s, &c. whereby it is manifeſtly proved, that Lime has a much greater Share in diſſolving the Calculus, than the fiery alcaline Salts of the Potaſh, did determine me to enter upon the following Courſe of Experiments, which I ſhall give an Account of with the utmoſt Plainneſs and Fidelity.

EXPERIMENT I.

I took two Ounces of common Lime-Water, made in the Proportion of ten Pounds of boiling Water to one Pound of Stone Lime, unſlack'd and freſh from the Kiln, and injected it blood-warm into the Bladder of a ſmall Spaniel Bitch, who expreſſed no manner of Uneaſineſs during the Time of its paſſing into the Bladder, nor at all afterwards. I kept her in the Room with me above two Hours, during which Time ſhe had no Motion to Urine, but lay perfectly eaſy, and ſlept a good deal.

It may be proper to obſerve here, once for all, that I always took Care to have the Dogs led gently round a large Garden, after they were taken out of the Kennel, by which means they generally went to Stool, and almoſt always emptied their Bladders juſt before I made the Experiments.

The above Experiment was repeated every Morning and Evening for three Weeks, without giving the leaſt Diſturbance that I could perceive. The Creature never ſhewed the leaſt Signs of Pain, had no Strainings to make Water, neither did ſhe ever, but once, void the Injection under an Hour, and ſometimes retained it much longer; for we always watched the Dogs in this and all the following Experiments, an Hour or more after each Injection. In ſhort, I was ſo fully convinced of the Innocency of this Medicine, that I haſtened to the next, where I endeavoured to make the

Lime-Water as ſtrong as I poſſibly could.

EXPERIMENT II.

To one Pound of Stone Lime, very well burnt, and taken hot from the Kiln, I put eighteen Pints of boiling Water, which, when it had ſtood four Hours, afforded thirteen Pints of clear Water. This was made hot again, and put upon another Pound of freſh Lime; and then, after four Hours more, it was poured upon a third Pound of Lime, ſo that, at laſt, I had but two Quarts of Water from three Pounds of Lime.

This, I think, was as ſtrong as I could well make it, and beſides, I took eſpecial Care to have the Veſſels it was made in as cloſe covered as poſſible, and when it was poured off, I kept it in Bottles well cork'd, and tied over with Bladders; for Dr. *Whytt* †, to whom we are much obliged for his ingenious Experiments, tells us, that Lime Water ſoon loſes its Virtue when expoſed to the Air.

Two Ounces of this Water was injected Morning and Evening into the Bladder of the above mention'd Bitch; but the fourth Injection came away in 36 Minutes, and in a Quarter of an Hour afterwards ſhe ſeem'd to ſtrain a little more than ordinary to make Water, and voided a ſmall Quantity of clear mucous Matter, juſt at laſt, which I imagined to be abraded from the villous Membrane of the Bladder, by the great Strength of the Lime-water; and indeed the fifth and ſixth Injections came away within the Hour, and ſeemed to leave ſuch a Stimulus behind them as provok'd frequent Strainings to Urine, but without voiding any mucous Matter at either of theſe Times. I purſued it three Days longer, and it ſtill ſeemed to irritate too much, ſo that to prevent this troubleſome Symptom, and to make it ſet eaſy, I diſſolved, by a gentle Heat, ſix Drams of Starch in a Quart of Lime Water, which gave it a fine Degree of Smoothneſs, and which does not at all abate its lythontriptic Virtue *. After this it agreed very well, and though I continued it a Month, I could never diſcover that it created the leaſt Pain or Uneaſineſs.

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† Medical Eſſays, Vol. V.

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* Medical Eſſays, Vol. V.

Not being quite ſatisfied however with this Experiment, becauſe I thought I had not tried the Lime-Water long enough by itſelf, I repeated it upon two other Dogs, both of which had two Ounces injected twice a Day for a Fortnight, without giving any Pain, or bringing away any Mucus; ſo that I believe the too great Irritation in the former Experiment, was owing either to the Newneſs of the Lime-Water, for I began uſing it the ſame Day it was made, or to ſome very fine Scum which ſwam upon it, for I did not filtrate it; whereas in the two laſt Trials the Lime-Water was filtrated, and alſo had been made ſome Days before I began uſing it.

But be this as it will, we have manifeſt Proof from theſe Experiments,

ments, that Stone Lime Water, though made as ſtrong as poſſible, may be born in the Bladder with Safety ; and even when it irritates too much, a little Starch will prevent ſuch an Effect, which I think is a great Happineſs, ſince, as we ſhall find hereafter, there is ſo much Probability of its aſſiſting at leaſt in diſſolving a Stone in the Bladder.

This Succeſs led me to make three or four other Experiments, in Order to try if I could, by any Means, increaſe the Strength of Lime-Water, or diſcover wherein its Virtue conſiſted.

1ſt. A Pint of this ſtrong Lime-Water afforded, upon Evaporation, ſixteen Grains of a very fine, white calcarious Matter, which I put to four Ounces of the ſame Sort of Lime-Water, and then digeſted ſeveral Calculi in it for ſeven Days, in a Heat nearly equal to that of the Human Body, in Order to ſee if it would increaſe its diſſolving Power; but it did not at all, other Pieces of the ſame Calculi loſing as much in plain Lime-Water, as in this.

Hence it appears that heating or boiling of Lime-Water muſt weaken its Virtue, ſince it conſiſts in volatile Matter, and not at all in the Reſiduum.

Another Thing obſervable was, that though this calcarious Matter was, before Evaporation, diſſolved or ſuſpended in a delicately clear tranſparent Water, yet now, neither rubbing it in a Glaſs Mortar, nor di-

digeſting it ſeven Days would diſſolve it again, but it always ſubſided to the Bottom of the Phyal, in the Form of a white Powder.

2dly. I put two Quarts of this ſame ſtrong Lime-Water into a Retort, and diſtilled only half a Pint, with a View of getting the moſt volatile Matter into ſo narrow a Compaſs, and to ſee how much ſtronger its lythontriptic Power would be made by ſuch a Proceſs: But in this alſo I was diſappointed, for it was not ſo ſtrong as it was before.

3dly. Three Pounds of Lime being put into a glazed Crock, and one and twenty Pints of boiling Water poured upon it, I immediately placed a large Cold-ſtill-head over it, by Means of ſome Bricks built round, ſo that during the

Ebullition I had ſix Ounces of Water diſtilled from it, which I thought would have been very pungent and ſtrong ; but when I came to examine it, I found it quite inſipid and inodorous, neither had it any viſible Effect on three different Calculi, which were digeſted in it for ſeven Days.

4thly. I evaporated two Quarts of ſtrong Lime-water in a narrow-neck'd Retort, and during the whole Time I ſuſpended two Stones, one very hard, the other ſoft, in the hotteſt and narroweſt Part of the Neck of the Retort, where the Steam muſt have the greateſt Power ; but it neither waſted nor ſoftened them in the leaſt.

By ſome of theſe Experiments I was in Hopes of diſcovering wherein the Virtue of Lime-water conſiſted, and whether it were poſſible to increaſe its Strength, either by adding the Reſiduum after Evaporation, to a ſmall Quantity of freſh Lime-water, or by ſeparating the moſt volatile Part by Diſtillation; but all my Reſearches have been in vain, perhaps, for want of ſufficient Accuracy in the ſeveral Proceſſes, or, perhaps, from the Impoſſibility in the Nature of the Thing. For if the lythontriptic Virtue of Lime-water is from concentrated Fire, which is attracted out of the Lime by the Water, and is for a Time confined in it; may we not ſuppoſe that in Diſtillation, the fiery Particles do make their Eſcape, and will not unite again with the Water in the Receiver? If this be not the Caſe, what Reaſon can be given why the Water that is diſtilled, as well as that which is left behind in the Retort, are both made weaker by ſuch Treatment?

The only Way then that I can diſcover of making Lime-water as ſtrong as poſſible, is by ſeveral repeated Affuſions of the ſame Water upon freſh Parcels of Lime.

EXPERIMENT III.

It appearing from Dr. *Whytt's* Experiments †, that Oyſter-Shell Lime-water poſſeſſes a much greater Power of diſſolving the Calculus than that of Stone-lime, I was willing to try that alſo, and accordingly I prepared ſome of it as he recommends, *viz.* with ſeven Pounds of Water to one of calcined Shells.

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† Medical Eſſays, Vol. V. P. 692.

It may be proper to obſerve, that the Shells I made Uſe of were very thin and ſolid; for I imagined that thoſe which are thick and porous, and have been for a long Time bleaching in the Sun, are not capable of making ſuch ſtrong Lime.

I had them very highly calcined in the Middle of a large Brick-Kiln, being burnt for two Days along with the Bricks; and when the Water was poured upon them the Ebullition was a great deal ſtronger than I ever ſaw from Stone-lime.

Two Ounces of this Water was injected into the Bladder of a Dog, every Morning and Evening, for a Month, without cauſing the leaſt Pain, or producing any ill Effect.

Theſe Experiments, I hope, are ſufficient to ſhew the Innocency of Lime-Water, when injected after this Manner into the Bladder.

I ſhall only add, that ſince Lime-water is a gentle Reſtringent, and has alſo a Property of diſſolving coagulated Blood, this Method of Injection ſeems well calculated to ſtop a Flux of Blood in the Bladder, and to melt down ſuch Clots as may happen to be too large to paſs the Urethra: For if the Catheter was to be introduced into the Bladder at ſuch a Time, and the Urine, which may be pent up by the Clots of Blood, obſtructing the Paſſage, drawn off, there could no Danger follow from the Diſtention of the Bladder, by injecting three or four Ounces of Lime-water, when, perhaps, a Pint or more of Urine had been juſt let go; and if the Catheter was to be left in, from Morning till Night, according to *Le Dran*'s Method, the Urine, *&c.* might be drawn off, and freſh Lime-water injected as often as thought proper, by Means of a Bladder tied on to the End of the Catheter, or by adapting the Noſe of a Syringe to it.

I have often found that when I have occaſioned the Dogs to void Blood with their Urine, by injecting too great a Quantity of Soap-lees, (as will appear in ſome of the following Experiments) that Lime-water would ſet eaſy in the Bladder at the ſame Time, and heal up the Wounds.

EXPERIMENT IV.

In a Quart of common Barley-water, I diſſolved half an Ounce of Starch, and to two Ounces of it I added forty Drops of the ſtrongeſt Soap-lees, and injected it Blood-warm into the Bladder of a large Fox-hound Bitch, every Morning and Evening, increaſing the Doſe every Day; ſo that in ten Days I came to the Proportion of a Drachm in Weight, or 136 Drops of the Lye, as it fell from a ſmall Phyal, to every two Ounces of the Water.

In this Manner I continued it a Fortnight without any Complaint; for the poor Creature being made much of, and tenderly uſed, ſeemed to be fond of having it done, and never once voided it till ſhe was let out of the Room, which was never under an Hour; oftentimes I kept her two, and ſometimes three Hours, in order to try how long ſhe would retain the Injection.

After this I increaſed the Doſe to 150 Drops of Soap-lees, and again to 170 Drops in every two Ounces of Barley-water, which alſo ſat very eaſy for a Week.

I then proceeded to 204 Drops of Lye, or a Drachm and a half in Weight; and here I continued it five Days before I perceived any Diſorder. But however, after this it always occaſioned great Strivings to make Water, and brought away a mucous Matter, which would lie in the Middle of the Puddle of Urine upon the Floor, like the

White of an Egg, a little diſcoloured with Blood.

From this Experiment it appears, that the Bladder of this Dog was able to bear from 136 Drops, to 170 Drops of Lye, in two Ounces of Barley-Water, with ſome Starch in it, without any Injury; and by what I could perceive, I dare ſay it would have done ſo a great while longer.

Dr. *Hales* and Dr. *Rutty* † both found that 26 Drops of Soap-lees to one Ounce of Urine, was ſufficient to diſſolve a ſoft Stone, in a Heat nearly equal to that of Urine in the Bladder. I ſhould therefore hope that the Quantity abovementioned would prove of great Service if it could be injected upon a Calculus in a Human Bladder, and continued for a proper Time.

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† Experiments on Mrs. *Stephens*'s Medicine.

Now ſince ſo much depends on the Soap-lees in this, and the following Experiments, I think it may be proper to mention its Strength.

What therefore I made Uſe of in all my Experiments, was a Gallon of the firſt Running from thirty buſhels of Wood Aſhes well burnt, and ſix buſhels of unſlack'd Lime. It was quite clear, and free from Sediment, and two Ounces Troy of it afforded, upon Evaporation to a perfect Dryneſs, 108 Grains of Salt.

EXPERIMENT V.

Seeing then that Soap-Lees mix'd in Barley-Water did no Injury to the Fibres of the Bladder, when injected in the Proportion of $\frac{1}{16}$ Part, it induced me to try how it would agree in common Lime-water (EXP. I.) made ſmooth by diſſolving ſix Drachms of Starch in every Quart.

I began with 40 Drops of the Lixivium, and gradually increaſed the Doſe to 100 Drops, in two Ounces of Lime-water; and here I ſtopt for three Weeks, injecting it every Morning and Evening; during which Time it agreed very well, and never cauſed the leaſt Diſturbance that I could perceive.

I then increaſed the Doſe to 136 Drops, and continued it for a Week, and afterwards to 150 Drops in every two Ounces of Lime-water; but this ſtimulated too much, and ſoon cauſed frequent Strainings to make Water, and voiding of mucous Matter, a little tinged with Blood.

Hence it appears however, that 100 Drops of Lixivium to two Ounces of common Lime-water, did ſit very eaſy in the Bladder, when the Acrimony of the Potaſh Salts was in ſome degree ſheathed by diſſolving a proper Quantity of Starch in it.

EXPERIMENT VI.

A Quart of ſtrong Stone Lime-water, (EXP. II.) being made ſmooth with ſix drachms of Starch, I put

30 drops of Soap-lees to 2 Ounces of it, and injected it into the Bladder of a Dog every Morning and Evening for a Week.

After this I gradually increaſed the Doſe till I arrived at 50 Drops; and here I continued it twice a Day for a Fortnight.

I then augmented the Doſe to 68 drops of Lye, which the fourth Day began to give ſome Uneaſineſs, and increaſed it ſo much afterwards, that the Creature would not retain it a Quarter of an Hour; beſides, it brought away at laſt Slime and Blood.

Here we ſee that when Lime-water is made ſo very ſtrong, it will bear but a ſmall Quantity of Soap-lees before it will give Pain, by abrading the villous Membrane of the Bladder in too great a Degree; but perhaps, 30 or 40 drops of Lixivium to two Ounces of ſuch ſtrong Lime-Water, may prove a powerful Lythontriptic.

EXPERIMENT VII.

Six Drachms of Starch being diſſolved in a Quart of Oyſter-ſhell Lime-water, (EXP. III.) I added to 2 Ounces of it 30 drops of Soap-lees, and injected it into the Bladder of a large Spaniel Bitch twice a Day for a Fortnight, during which Time no Complaints appeared.

I then increaſed the Doſe to 50 drops; which alſo agreed very well; but when I arrived to 80 drops it ſoon occaſioned frequent Strainings to make Warer, but did not bring away any Mucus or Blood.

From this Experiment it appears that Oyſter-ſhell Lime-water will bear but a very little more of the Lixivium to be added to it, than the ſtrongeſt Stone Lime-water will, before it irritates the Bladder too much.

EXPERIMENT VIII.

Having procured ſome of Dr. *Jurin*'s Lixivium Lythontripticum from his Apothecary, I put a drachm of it into two Ounces of Barley-Water with Starch in it, (EXP. IV.) and injected it Milk-warm into the Bladder of a Dog twice a Day. In two Days it brought on frequent Strainings to make Water, I ſuppoſe from the

Lime-Powder, with which it is ſo plentifully ſtored, adhering to, and irritating the villous Membrane of the Bladder. However, I continued it two Days more, and afterwards enlarged the Doſe to a drachm and a half, which ſeemed to cauſe a good deal of Pain, and brought away Slime and Blood.

I repeated this Experiment upon another Dog with the ſame Effect; ſo that we plainly ſee, that though Lime may be taken in Powder, and ſits tolerably eaſy in the Stomach, yet the Bladder cannot bear to be irritated by ſuch of its Particles as are too groſs to be ſuſpended in a clear tranſparent Water.

EXPERIMENT IX.

In two Ounces of common Lime-water (EXP. I.) I diſſolved two Scruples of Alicant Soap, and injected it into the Bladder of a Dog twice a Day. I could not diſcover that the three or four firſt Injections cauſed any Pain; but afterwards they did a great deal, with a conſtant Irritation to make Water for almoſt the Space of an Hour after the Injection was diſcharged. In four Days Time it brought away a good deal of ſlimy, mucous Matter, tinged with Blood, ſo that I purſued it no farther.

I repeated this Experiment afterwards, by diſſolving the Yolk of an Egg along with the Soap. And again, another Time, I added Starch to the Lime-water, as above, but all to no Purpoſe; I could not inject above half a drachm of Soap in two Ounces of Lime-water, before it brought on ſuch Uneaſineſſes that the Dogs would ſeldom keep it ten Minutes.

Hence it appears that Soap is more offenſive to the Bladder than the Lixivium it is made from.

I know our Soap-boilers uſe a great deal of Sea-Salt, not leſs than two buſhels in a boiling, in order to granulate the Fat and Potaſh Salts; but whether they do ſo abroad, or if they do, whether it be owing to this, or ſome other Cauſe, is not very material to our preſent Purpoſe, ſince it is proved above, that the Lixivium may be injected in greater Quantities, and conſequently has a better Chance to diſſolve the Stone.

EXPERIMENT X.

Having ſpent three Months in purſuing theſe Experiments, and not knowing how to proceed with any Advantage, unleſs I had more proper Subjects to make them upon, I was willing to cloſe this important Reſearch, by trying if I could keep any of the Injections in the Bladder all Day long; that is, I watched the Dogs continually, and whenever they diſcharged one Injection, I immediately adminiſter'd another; the Reſult of which was as follows:

1ſt. Oyſter-ſhell Lime-water, and the ſtrongeſt Stone Lime-water ſat ſo eaſy, and continued in the

Bladder ſo long, that I made but four Injections of the firſt, and five of the laſt in the Space of fourteen Hours.

2dly. Twenty five Drops of Soap-lees, in two Ounces of each of the abovementioned Waters, with Starch diſſolved in them, were injected ſix Times in fourteen Hours, without cauſing any Pain or Uneaſineſs.

3dly. Fifty Drops of Soap-lees to two Ounces of Oyſter-ſhell Lime-water ſeemed to irritate too much after the fourth Injection, and ſeldom was retained above an Hour; ſo that by injecting it ſo often at laſt, it brought away Mucus and Blood, and cauſed almoſt conſtant Strainings to make Water.

Hence it appears that Oyſter-ſhell Lime-water and Stone Lime-water may be injected into the Bladder as often as the Urine is diſcharged, and alſo that Soap-lees may be added to them in ſmall Quantities; but we muſt be cautious how we adminiſter large Quantities of Soap-lees when the Injections are to be repeated ſo often.

The laſt Enquiry I made, in order to ſhew the Safety of ſome of the foregoing Experiments, was by inſpecting the Bladders of two of the Dogs which had gone through the longeſt Courſes, *viz.* with Oyſter-ſhell Lime-water, and Stone Lime-water, firſt plain, and afrerwards mixed with Soap-lees.

Upon opening theſe two Dogs, after they were hanged, I found both their Bladders of a natural Bigneſs, the Coats not at all thickned, neither was there the leaſt Appearance of any Inflammation in the Bladder, or Urethra, though they had been under this Courſe, in one Shape or other, for near three Months.

This gives us great Encouragement to hope, that if the ſame Menſtrua were to be injected into the Bladders of Men, for the ſame Length of Time, they would produce no worſe Effects, ſince I know no Reaſon why we ſhould think that the Fibres of the Bladder of a Man are more ſenſile and tender than thoſe of a Dog.

Another Thing which I obſerved in the Courſe of theſe Experiments, and which I think ſpeaks a good deal in their Favour, was, that though I often enlarged the Doſe of Soap-lees, *&c.* ſo much as to bring away Slime and Blood, and to cauſe frequent and violent Strainings to make Water; yet all theſe Symptoms diſappeared in a Day or two, if I deſiſted from the Injections, which ſhews that the Wounds were very ſuperficial, and that the injured Fibres of the Bladder and Urethra very ſoon healed up, and recovered themſelves.

Thus have I given a plain and faithful Account of the Succeſs of each Experiment, as it appeared to me from the moſt careful Obſervation; and conſidering of what vaſt Importance this Method of Cure would be to the World, if it could be brought to Perfection, I think it well deſerves to be purſued, and humbly hope we might, by proper

Application, be indulged in making a ſufficient Number of Trials upon *Convicts*, beginning with plain Stone Lime-water, or Oyſter-ſhell Lime-water, and afterwards adding Soap-lees, or any other Medicine in ſuch ſmall Quantities as would not injure the Fibres of the Bladder.

By theſe Means we ſhould ſoon arrive to the Knowledge of what Degree of Strength any Menſtruum might be injected; and if it ſhould appear by proper Experiments, that ſuch a Menſtruum will diſſolve a Stone without the Body, we have all the Reaſon in the World to believe it will do the ſame within; at leaſt we may be ſure it will greatly aſſiſt all other Methods made Uſe of towards the Cure.

I ſhall here ſubjoin ſome Experiments which were made and communicated to me by the Rev. Dr. *Hales*, and which are ſo nearly related to the abovementioned Experiments, that if both our Propoſals were to prove ſucceſsful, they would ſoon prevent, or cure the moſt excruciating Diſtemper incident to Mankind. I hope therefore I ſhall be pardoned for publiſhing them here, notwithſtanding they may be already, or very ſoon will be publiſhed in the Philoſophical Tranſactions.

A Propoſal to bring ſmall paſſable Stones ſoon and with Eaſe out of the Bladder,

By Dr. HALES.

BEING preſent, *February* 4th, 1744-5, when the late Right Hon. the Earl of *Orford* (after having taken, for two Months, weak Soap-lye with Lime) voided at once eleven pretty large nearly cubical Fragments of larger Stones, which were involved in coagulated Blood and Urine, and a few Hours after, fifteen more at once, in the ſame Manner, in all thirty two that Day, ſome of which were as large as were poſſibly paſſable: It hence immediately occurred to my Thoughts, that all paſſable Stones, which have lately fallen from the Kidneys into the Bladder, or which have broken off from larger Ones, might readily and eaſily be brought out thence, by conveying with a Catheter into the empty Bladder, ſome very mucilaginous Subſtance, ſuch as Syrup of Marſh-Mallows, or a Solution of Gum Arabic; ſuch Subſtances would bring the Stones away ſoon, and with great Eaſe to the Patient; and thereby not only prevent much teazing Pain, by fruitleſsly endeavouring to bring them away, with the weak Force of thin Urine; but alſo effectually ſecure the Patient from the Danger of their growing too big to come away, by long continuing in the Bladder.

And what ſtrongly evinces the Reaſonableneſs of this Propoſal, is, that on opening the Bladder of his Lordſhip, there were no Stones found remaining, except two ſmall Grains, which were involved in the Folds in the Neck of the Bladder.

If on Tryal, any Stones ſhall be found too big to paſs off, the Patient is but where he was before; and if any ſhall be of ſuch a Size, as to enter the Urethra but Part of the Way, they may be puſhed back, or cut out, according as their Situation ſhall happen to be.

And further to evince the Reaſonableneſs of this Propoſal, I made the following Experiments, *viz.* in order to ſhew the comparative Force, with which Fluids of different Degrees of Denſity and Tenacity will impell Stones, I took a Glaſs Tube which was an Inch in Diameter within, and fourteen and a half Inches deep; and having filled it full of Urine, I put into it a nearly cubical Piece of a large Stone taken out of a human Bladder, which weighed ſeven and a half Grains. And ſtanding by a Clock whoſe Pendulum beat Seconds, I found by repeated Tryals, that the Stone was a Second and a Quarter in deſcending through fourteen and a half Inches Depth of Urine.

The ſame Experiment being tryed with the ſame Stone, in Oil of Olives, it was five and three Quarters Seconds in deſcending; ſo that the Reſiſtance of the Oil to the falling Stone was 4, 6, that is nearly four Times greater than the Reſiſtance of the Urine; and conſequently the impelling Force of Oil to propell a Stone in paſſing through a narrow Tube, would be proportionably ſo much greater, than that of Urine, were their Velocities equal.

When an Ounce of Gum Arabic was diſſolved in half a Pint of Water, the Stone deſcended in two Seconds; with two Ounces in three Seconds; with three Ounces in four Seconds.

In a Decoction of warm Barley-Water, which was ſo thick as to be a tender Jelly when cold, the Stone was 45 Seconds in deſcending, that is, thirty five Times ſlower than in Urine. And conſequently the impelling Force of Urine is thirty-five Times leſs, than that of this Mucilage, in Caſe their Velocities were equal. This Mucilage was, as I gueſs, of a due Conſiſtence for the Purpoſe, for it was about the Thickneſs of Lord *Orford*'s coagulated Blood and Urine. Equal Quantities of Blood and Urine will continue a thick Coagulum for many Weeks.

But as the Velocity with which ſuch mucilaginous Subſtances paſs through ſmall Tubes is conſiderably leſs than the Velocity with which Urine will paſs, ſuppoſing their impelling Forces to be equal, it was requiſite to determine thoſe different Velocities by Experiments. And in order to it, I put half a Pint of the ſame Blood-warm Decoction of Barley into a Glaſs Veſſel, where its Depth was near eight Inches, and therefore its mean Depth near four Inches; it run out of the Bottom, in about fifty Seconds, through a Glaſs Tube whoſe Bore was $\frac{1}{7}$th Inch Diameter, its Length two Inches. And on repeating the ſame Experiment twice, as the Decoction grew cooler and cooler, it was about eighty, and then ninety Seconds in running out; whereas a like Quantity of Urine ran out through the ſame Tube in eighteen Seconds.

Now ſuppoſing the Velocities at a Medium, through the Urethra to be as Seventy-two to Eighteen; then the Velocity of the Urine, will be three fourths greater, than that of the Mucilage of Barley. Taking therefore three fourths from thirty ſix, the Force of the Mucilage, the Remainder nine, is the Force with which the Mucilage will impell the Stone; and conſequently the impelling Force of the Mucilage in the Neck of the Bladder, and in the Urethra, will be nine Times greater than that of Urine, beſides the Advantage of greater Slipperineſs, which it gives to the Urethra.

This Propoſal of Dr. *Hales*'s is ſo rational a Method of bringing away all paſſable Stones out of the Bladder, that I think we may ſafely pronounce it an *Experimentum Crucis*; and I make no Doubt but if it was to be regularly put in Practice, after every nephritic Fit, or whenever a Nucleus, which is firſt generated in the Kidney, drops into the Bladder, it would ſoon bring it away, and thereby prevent the Growth of the Stone in the Bladder.

It very often happens that when a ſmall Stone firſt drops into the Bladder, it ſo lodges itſelf between the Folds or Corrugations of the internal villous Membrane, as to give little or no Pain. A careleſs Neglect of it here for ſome Weeks, tho' it ſhould all the while lie eaſy, may be of bad Conſequence, by Reaſon, in many Conſtitutions greatly diſpoſed to generate Stones, the Nucleus may grow too large to paſs the Urethra, though it was not, and I believe ſeldom or never is ſo, at its firſt falling down.

But when the Stone deſcends to the Neck of the Bladder, we all know what excruciating Pains it brings on, and how long it ſometimes remains there for want of a ſufficient Force in the Urine to bring it away. The great Stimulus that the ſharp Points of a Stone occaſion on the Neck of the Bladder, provokes ſuch frequent Micturitions, that a Man has not Patience to retain a ſufficient Quantity of Urine, to make Water with a full Stream; and therefore cannot propell the Stone through the Urethra for Want of a ſufficient Impetus.

In both theſe Caſes I ſhould hope that if as much mucilaginous Liquor was to be injected as the Bladder could bear without great Pain, it would diſlodge any ſmall Stone from between the Folds, and bring it through the Urethra with Eaſe and Safety.

I believe it ſeldom happens that the Nucleus is primarily generated in the Bladder, or that one of any Size, beyond what is commonly called Sand, or very ſmall Gravel, ever deſcends through the Ureter into the Bladder without the Knowledge of a careful Obſerver; ſo that we ſhall always have plain Indications when to make the Injections, which I think ought to be as ſoon as poſſible after the Stone is fallen into the Bladder, and never to deſiſt from them, allowing proper Intervals, till we have brought the Nucleus away.

I have mentioned above that as much mucilaginous Liquor ſhould be injected as the Bladder can bear without great Pain; for ſome Pain it will always be to ſtretch out the Corrugations of the Coats and Membranes into a ſmooth Surface, becauſe ſuch a Force muſt neceſſarily elongate the nervous Fibres beyond their natural Tone. Hence the Urine, when retained in too great a Quantity, gives Pain, and conſtantly excites us to let it go, not ſo much by its Pondus or Stimulus, as by the Diſtention of the Bladder. Hence alſo we ought to be very careful not to diſtend the Bladder too much, nor too haſtily, which would not only create great Pain, but it might weaken or deſtroy the contractile Power of the ſeveral Coats and Membranes; the bad Effects of which are well known.

I therefore don't propoſe that theſe, or any other Injections ſhould be made by every unskillful Hand; I think it only belongs to the moſt experienced *Surgeons*, who beſt know how to paſs the Catheter into the Bladder, and alſo to remedy any Accident that may happen in bringing the Stone through the Urethra.

It may not be amiſs juſt to mention the Method I made Uſe of to inject the ſeveral Menſtrua above-mentioned, into the Bladders of Dogs; becauſe I always found it the moſt eaſy Way of any that I could invent. To the great End of a Catheter I tied on a Calves Bladder, in the ſame Manner as is commonly done to a Clyſter-pipe, then ſtopping that End with a ſmall Cork I poured the Injection into the Calves Bladder, and tied it up very cloſe ſo as to exclude the Air. After this I introduced the Catheter into the Dogs Bladder, and having thruſt the Cork out of the Head of the Catheter, I gently ſqueezed the Bladder with one Hand, whilſt with the other I held the Catheter ſteady; by which Means I propelled the Menſtruum without any Pain or Trouble. I always found this a much eaſier Way than doing it with a Syringe, which is apt to jerk, and is not in many other Reſpects, ſo much at our Command. The great End of the Catheter for this Purpoſe ſhould reach an Inch or more beyond the two Side Handles, for the better Convenience of tying on the injecting Bladder; and the Orifice there ſhould be made large enough to receive a ſmall Cork.

One Thing more I beg Leave to propoſe, with Submiſſion to the ingenious *Lythotomiſt*; *viz.* Whether it would not be of Uſe to inject a very thick Mucilage into the Bladder of one juſt cut for the Stone, in order to bring away any Fragments, or ſmall Stones out of the Bladder? This would probablo be more effectual than ſo thin a Mucilage as common Barley-water, which I have been told is ſometimes injected for ſuch Purpoſes.

Phyſical Experiments

WITH THE

LAURO-CERASUS,

In Order to inveſtigate its Properties, and Manner of Action in Animal Bodies.

Which were read before the ROYAL SOCIETY *in* 1734.

Phyſical Experiments

WITH THE

LAURO-CERASUS.

SINCE Dr. *Madden* communicated to the *Royal Society* an Account of the deadly Effects of the ſimple diſtilled Water from the *Lauro-Ceraſus*, many Experiments have been made, here in *England*, to prove and confirm the Truth of the ſame; but I don't know of any Attempts that have been made towards diſcovering what Influence this Water, or the Leaves from whence it is diſtilled, would have on Animal Bodies, if exhibited in ſmall Doſes, and continued ſo for ſome Time. Now as this, in my humble Opinion, is the only Way of inveſtigating the uſeful Properties of ſuch Plants whoſe *Modus* of Action we are unacquainted with, I hope the following Experiments will be acceptable; for let them be ever ſo ſimple, they may lead us to greater Diſcoveries, and without Doubt one of the moſt conſiderable Services we can do Mankind, is to be diligent in making a Variety of Experiments, and collecting Obſervations; and when we have procured a Number of theſe, it will be allowable to reaſon upon, and deduce proper Inferences from them.

To find out the Virtues of Plants has ever been reckon'd the moſt commendable Undertaking, and nothing is more certain than that the likelieſt Means to diſcover the Efficacy of ſuch as are not as yet uſed in Phyſic, is to have Recourſe to proper Experiments with them upon Brutes; for though ſome Things may be hurtful to Man, that are not ſo to other Animals, and *vice verſa*, yet as the greateſt Number of Medicines affect both equally, the Exhibition of them to Brutes will afford good Opportunities for obſerving their Effects. "Doubtleſs, "ſays the illuſtrious *Boyle*, we trample upon many Things, that, "did we know their Uſes, might "ſerve the nobleſt Ends. We deſpiſe many common Plants of "extraordinary Efficacy for Want "of taking Pains to diſcover their "Virtues; and tho' ſome may be "deleterious or poiſonous in themſelves, or in large Doſes, yet 'tis "probable that Art many diſcover

“ Ways and Means to reduce ſuch
“ Druggs into uſeful Medicines.

Some indeed have taken great Pains to find out the Virtues of Plants by a chymical Analyſis; others by mixing them with extravaſated Blood, or by injecting them in ſome Form or other, immediately into the larger Blood-Veſſels; and there have been thoſe who have pretended to know the Virtues of Plants by their *Facies externa*; but the Method which I would recommend as the moſt certain and natural Way of inveſtigating the good or bad Qualities of ſuch Drugs as are not as yet received into the Practice of Phyſic, and which I am ſure would be of great Uſe if diligently and accurately purſued, is to adminiſter them to Brutes by the Mouth; for ſince the Powers of Digeſtion, and the various Sorts of

Fluids they meet with before they enter the Circulation, oftentimes aſſimilate and change them into quite different Natures; and conſidering how gradually any Medicine is imbibed and blended with the Blood, when taken by the Mouth, it evidently appears that its Effects will be in Proportion to the Commixture; whereas it is obſervable, that the moſt innocent Liquor poured into the Blood-Veſſels all at once, creates great Uneaſineſs.

I am of Opinion we have *Simples* of our own Growth, capable of curing the moſt formidable Diſeaſes, did we but underſtand their Efficacy, and the beſt Manner of applying them; and I doubt not but a further Acquaintance with experimental Philoſophy will hereafter ſuggeſt Ways and Means of diſcovering their Virtues, and of making moſt noble Medicines from ſuch Plants which are little thought of at preſent, at leaſt, for ſuch Uſes. I therefore, with all Humility, beg Leave to offer the following Experiments to the Conſideration of the *Learned*; being well aſſured that the Uſefulneſs of all Plants chiefly depends upon the Knowledge we have of their Properties; and conſequently the more we diſcover of theſe, the greater Benefits we ſhall be capable of receiving from them.

EXPERIMENT I.

Having procured a Peck of freſh Laurel Leaves, I weighed them very exactly, leaſt I might be deceived by different Meaſures in future Tryals; and accordingly I found their Weight to be two

Pound, one Ounce and a half *Averdupois*. To theſe I put three Gallons of Spring Water, and diſtilled off, in a common Alembic, two Quarts, which were mixed together.

In order to try the Strength of this Water, I gave four Ounces of it to a large Maſtiff Dog, in the Prime of his Strength, which, in a few Minutes, threw him into moſt terrible Convulſions, and, within the Space of an Hour, put an End to his Life.

Upon opening the Dog, I found nothing remarkable, but what is already taken Notice of in the *Philoſophical Tranſactions*, *Numb.* 420, by Dr. *Mortimer*. In the Stomach I met with ſix Ounces of very viſcid, ſizy, clear Mucus, much like the Whites of Eggs, or rather more tenacious, for when I poured it into a Baſon, and inclined the Baſon a little on one Side, in order to blow off ſome Froth which was upon it whilſt in the Stömach, that Part which ran over drew all the reſt after it, and left the Baſon quite dry.

This Phænomenon led me to make the following Experiment.

EXPERIMENT II.

I cut out the Stomach of a Dog whilſt alive, and inſtantly poured into it four Ounces of Laurel-water, in order to try whether the *Liquor Gaſtricus* would be coagulated by it, as in the former Experiment; but no Alteration in the leaſt was made, tho' there was an Ounce and a half of Liquor in the Stomach, (as I found afterwards by weighing it) and the Dog was purpoſely kept faſting, that no indigeſted Matter might interrupt the Experiment.

Thinking then that the Heat of the Stomach was much greater when in the Body, and ſurrounded by the Viſcera, as in the foregoing Experiment, which might be one Reaſon of the Coagulation, I immediately immerſed the Stomach, and its Contents, in warm Water, but a few Degrees below that of a ſcalding Heat, and kept it there twenty Minutes, without making any Alteration in the Conſiſtence of its Contents.

Since therefore Laurel-water conſtantly coagulates the *Liquor Gaſtricus* when exhibited as in the firſt Experiment, (for that I have always obſerved) may we not from this Experiment, reaſonably conclude that by the Action of the Laurel-water upon the Nerves and excretory Ducts, ſome third Sort of Matter is caſt into the Stomach, which ſtrongly attracts both the Laurel-water and Gaſtric Juice; and by that Means becomes the Bond of Union?

EXPERIMENT III.

I thruſt a *Trochar* into the Cavity of the Abdomen of a large Dog, and injected thro' the Canula four Ounces of Laurel-water, which inſtantly gave him great Pain, and within four Minutes, brought on Convulſions, a Difficulty of breathing, and in 22 Minutes, Death.

Hence it is obvious that Laurel-water produceth its dreadful Effects ſooner when applied in this Manner, than when it is ſwallowed. It muſt be confeſs'd indeed that many more

Parts are expos'd to the Inſults of the Laurel-water by injecting it into the Cavity of the Abdomen; but it muſt be granted alſo that all the Nerves there are defended by the Peritoneum, which not only lines the whole Cavity, but contains the Liver, Spleen, Omentum, Stomach, Guts, and Meſentery, with all their Veſſels and Glands; ſo that if the moſt volatile, ſubtile Particles of the Laurel-water had not a Power of paſſing thro' this Membrane, as well as the Proceſſes of the *Dura* and *Pia Mater*, which cover the Nerves, ſuch prodigious Conſequences could never be brought about in ſo ſhort a Time, merely by that Pittance of Laurel-water, which may be imagined to enter the common abſorbent Veſſels, which terminate in the Veins.

If I might be indulged in an Hypotheſis, I ſhould think that Laurel-Water kills chiefly by fixing, or ſome other Way deſtroying the animal Spirits in the Nerves; for ſince no Inflammation or Obſtructions in the Blood-Veſſels appear, which could occaſion ſuch ſudden and violent Death; ſince no extravaſated Blood is found in the Brain; ſince the Arteries are all empty, and the Veins extremely turgid and full; ſince both the Ventricles of the Heart are greatly diſtended with fluid Blood; ſince Reſpiration is ſo exceeding difficult, without any viſible Obſtructions in the Lungs; ſince Senſation is ſo ſoon deſtroyed; ſince Convulſions are ſo ſoon excited; and ſince all theſe Things are brought about ſooner than we can poſſibly imagine the Craſis of the Blood to be alter'd and ſpoiled enough for ſuch Purpoſes; it is but reaſonable to conclude that ſome of the moſt ſubtle, ſulphureous Particles of the Laurel-Water do ſtrongly attract and fix ſome of the Animal Spirits, whilſt others, more groſs, do ſtimulate the Nerves, and excite thoſe grievous Pains and Convulſions obſervable within four or five Minutes after the Exhibition.

One Phænomenon that I have obſerved in other Dogs, which I have killed with Laurel-water, ſeems to ſupport this Suppoſition, *viz.* that one Ounce of Laurel-water will occaſion more violent and ſtronger Convulſions than five or ſix Ounces will do, which I imagine proceeds from the Spirits being but partly abſorbed and fixed by a ſmall Quantity, whereas the Gas or ſulphureous Blaſt which ariſes from a much larger Doſe, like a Flaſh of Lightning, almoſt inſtantly puts a Stop to all Motion.

EXPERIMENT IV.

To an old caſt-off Horſe, blind, and troubled with the Pole-evil, I gave a Pint (Wine Meaſure) of Laurel-water in the Morning faſting, he having been tied up to an empty Rack, all Night for that Purpoſe.

Juſt before I gave it him, I took ℥vij. ʒi. ℈i. of Blood from the jugular Vein, which was extremely viſcid and foul, looking at firſt like coarſe Greaſe, and after it had ſtood ſometime, it had a Coat upon it above an Inch thick, tough and horny, rather reſembling one Part of Brawn than Buff-Leather. The Gore was of a deep black. The

Serum was pellucid, but no more in Quantity than ſix Drams.

The Pulſe, before he took the Laurel-water, beat 34 Strokes in a Minute, and indeed they were not ſo much accelerated by the Doſe as I expected, they never exceeding 45 that Day. The only viſible Effect (for it did not make him in the leaſt ſick) was ſtopping the Humour that flowed from his Pole; which, tho' it ran in an extraordinary Manner before he took the Laurel-water, was quite ſuppreſſed in the Evening. About two Hours after he had taken his Doſe, I gave him ſome Oats, which he eat greedily, and continued perfectly well all Night.

The next Morning I let ℥vij. ʒi. of Blood, which, after it hath ſtood 24 Hours, as the other did, ſeparated ℥i. ℈ij. of clear, ſtraw-coloured

Serum. The Craſſamentum was ſomething improved in its Colour, and the horny Coat a-top of it was not quite $\frac{3}{4}$ of an Inch thick.

As ſoon as he had done bleeding, I gave him a Quart of Laurel-water, which in 40 Minutes began to make him exceeding ſick, and to reel and ſtagger. Soon after this he lay down, fell into a profuſe Sweat, and expreſſed a vaſt deal of Pain, by his groaning, kicking, and rolling about. The Pulſe were much quickned during this Time; I counted, when he ſeemed to be moſt in Pain, 85 Pulſations in a Minute. Thus it continued between four and five Hours, with ſome little Intervals of Eaſe, when he would get up for a Minute or two, and fall down again, and repeat the ſame Complaints. No ſtrong Convulſions appeared during the whole Time, but almoſt every Part twitched and trembled. What moſt ſurprized me was, that all theſe deſperate Symptoms vaniſh'd as it were inſtantly, the Horſe roſe up, ſtretched himſelf out, made a great deal of limpid clear Water, fell to grazing, and complain'd no more.

The Pole-evil was quite ſhut up all this Day, and therefore that I might know how long it would remain ſo, I deſiſted from giving any more Laurel-water for three Days. The next Morning the Humour began to flow again, tho' not ſo much as before; but on the third Day there ſeemed to be as great a Diſcharge as ever.

On the fourth Morning therefore, I gave him three Pints of Laurel-water, which in ten Minutes brought on moſt violent Convulſions; he fell down, breathed with great Difficulty, and groaned in a hideous Manner: But that particular Convulſion, called *Opiſthotonus*, which draws the Head back to the Tail, and which is always obſervable in Dogs, tho' I forgot to mention it before, did not happen here. The Pulſe in the Midſt of theſe Agonies beat at the Rate of 103, and ſometimes more, in a Minute. A moſt profuſe Sweat broke forth about an Hour after he had taken it, and continued more or leſs till he died.

Two Hours before he died, I took ℥vij. of Blood from the jugular Vein, which ſeparated ℥ij. ʒv. ℈ij. of pellucid Serum. The Coagulum was much tenderer, and of a better Colour than before, and the foul Part at Top was now rather like Size, and not much more than ⅓ of an Inch thick.

The Horſe died exactly four Hours and a half after he had taken his Doſe.

From this Experiment we have a ſurprizing Inſtance of the Strength and Subtilty of Laurel-water. For to be able to accelerate the Pulſes to above three Times their uſual Number; to ſtop, for ſome Time, a violent Flux of Matter from an old Fiſtula; and to attenuate, divide, and alter the Arrangement and Cohæſion of the Particles of ſuch viſcid, ſtrong, foul Blood, requires nothing leſs than the moſt active Agents, which muſt be endued with Properties capable of aſtringing the Veſſels to the greateſt Degree, and their attractive Qualities muſt be mighty ſtrong to produce ſuch ſurprizing Effects.

Having now ſeen the amazing and deſtructive Properties of Laurel-water, when exhibited in large Quantities, I ſhall proceed to examine into its Nature and Qualities when adminiſter'd in ſmall Doſes, and continued for ſome Time.

EXPERIMENT V.

July 14, 1733, I began giving a Dog, 21 Inches high, in perfect Health, and luſty in Fleſh, a Dram of Laurel-water, diluted with two Drams of Spring Water, and repeated it every Morning, after the ſame Manner, for a Month.

The Pulſe before he took the Laurel-water, beat about 78 Strokes in a Minute, according to ſeveral Obſervations.

Two Ounces and a half of Blood being drawn from the Jugular Vein, juſt before he enter'd the Courſe, I poured off the Serum from the Gore, after it had ſtood in a cool Place, 24 Hours, that I might know what Proportion they bore to each other, and upon weighing the Serum I found it amount to 34. gr. xxvij.

It may be proper to remark here, once for all, that all the Blood let in the following Experiments was from the Jugular Veins; and that the Operation was always performed in the Morning faſting, that I might not be deceived in the State of the Blood, by the Addition of freſh Chyle. It may be proper alſo to obſerve, that before I felt the Pulſes of this, or any of the Dogs hereafter mention'd, I always got them into a quiet eaſy Temper, and as they were always confined in a Kennel about 12 Feet ſquare, they could not ſtir enough to accelerate their Pulſes more at one Time than another.

The Dog always expreſs'd ſome little Uneaſineſs immediately after taking the Laurel-water, but in ſuch a Manner that I could not judge whether it proceeded from our forcibly pouring it down his Throat, or from the Thing itſelf; however, about an Hour after, a gentle, glowing Heat diffuſed itſelf, which might be felt on the Inſide of his Thighs, Flank, Tip of his Noſe, and Bottoms of his Feet.

After he had taken it ten Days, the Pulſe beat between 90 and 100 Strokes in a Minute, and ſomething ſtronger than before.

I could not perceive that it increaſed or ſuppreſſed any of the Secretions or Excretions, neither did it make him at all thirſty, nor decreaſe his Appetite.

The Dog being uſed gently, began to take his Doſe with very little Reluctance, and did not ſeem ſo uneaſy after taking it as at firſt. The only Things obſervable were, that he moſt Times belched up ſome Wind ſoon after taking it, and he ſeemed to complain of a Roughneſs in his Throat, by a little Cough, or rather by a Sort of Hemming for ſome little Time afterwards. I have been informed by ſeveral Nurſes, that it has been a long and conſtant Cuſtom among them to boil a Laurel Leaf in the Pap when their Children were troubled with Wind, and that long Experience had taught them both the Wholeſomneſs and Uſefulneſs of it. By this Experiment I am aſſured, that Laurel-water expels Wind from the Stomach.

Auguſt 8. Two Ounces and a half of Blood ſeparated 35 gr. 35. of Serum, about the Colour of *Burgundy* Wine. The Craſſamentum was ſomething improved in its Colour, and was of a good Conſiſtence. I found by Trial purpoſely made, that this ſmall Quantity of Blood loſt by ſtanding 24 Hours, in a glazed Cup, gr. 35 of its firſt Weight, which put me upon weighing the next Parcel very often, that I might know in what Proportion the volatile or moſt ſubtile Parts of the Blood flew off; and accordingly it appeared that at the End of the firſt Hour it had loſt gr. vi. the ſecond Hour gr. x. the third Hour g. xijſs. the fourth Hour gr. 14. the ninth Hour gr. xx. the fifteenth Hour gr. xxvj. and at the End of the twenty fourth Hour gr. xxxiiij. This I mention becauſe I think it neceſſary in Experiments of this Kind, to note all the minuteſt Circumſtances.

Auguſt 11. I encreaſed the Doſe to a Dram and half of Laurel-water diluted with two Drams of Spring-water, as before. After he had taken this twelve Minutes he reached once, and vomited up a little viſcid, mucilaginous Matter, which was the only Effect I could perceive from it at that Time. The next Morning he did the ſame, ſo that I was under a Neceſſity of adding two Drams more of Spring-water to it, or otherwiſe he would have conſtantly thrown it up. In this Manner it paſſed the Stomach very eaſily, and he took it every Morning faſting for the ſecond Month.

During the Beginning of this Month the Pulſe generally beat about

bout 110 Pulſations in a Minute, and towards the latter End from 110 to 122, which was the higheſt Number; for as I conſtantly felt them two or three Times a Day, I think I could make no Miſtake. The Dog continued perfectly well, he eat heartily, grew fat, and the viſible Excretions were regular and in good Order during the whole Time.

Sept. 5. Two Ounces and a half of Blood ſeparated ʒvi. gr. 50. of Serum of a bluiſh Caſt. This Blood appeared exceeding florid as it ran from the Vein, and the Cruor continued ſo after the Separation.

Sept. 8. I increaſed the Doſe to two Drams of Laurel-water, mix'd with half an Ounce of Spring-water, which made him vomit once, as before; but by adding two

Drams more of Spring-Water it ſet eaſy, and he took it after this Manner, for the third Month.

The Pulſe towards the latter End of this Month, beat about 130 Strokes in a Minute; I never found them during the whole Month, under 110, nor above 135. The Dog continued in perfect Health, and grew vaſtly fat.

Oct. 6. Two Ounces and a half of Blood ſeparated ʒvijſs of Serum of a much brighter Colour than is natural to Dogs; there being but little Difference between this and that of a healthy Man. This Blood ſtreamed out in a larger Arch than at any Time before, and look'd extremely florid and beautiful. When it had ſtood 24 Hours, the Coagulum was as vivid as poſſible, and of a more tender Conſiſtence than is uſual.

Hence we may obſerve, that tho' Laurel-water in large Quantities, and not diluted, is a very rank Poiſon, yet when it is exhibited in ſmall Doſes, and properly diluted, it produces no bad Effects. It appears alſo by this Experiment, that Laurel-water in ſmall Doſes increaſes the Celerity of the Circulation, attenuates the Blood, renders the Animal chearful and lively, and does not interrupt the ſenſible Excretions: How it will act in larger Doſes, the ſucceeding Experiments will evince.

EXPERIMENT VI.

July 28, 1733. To a large Grey-hound Dog, 27 Inches high, about a Twelvemonth old, and in perfect Health, I gave two Drams of Laurel-water in a quarter of a

Pint of Milk, and repeated it every Morning for a Fortnight.

Before he took the Laurel-water, his Pulſe generally beat between 70 and 80 Strokes in a Minute; tho’ ſometimes they did not reach to 70, and once or twice they exceeded 90. All theſe Variations happened without eating or drinking, and within the Space of four Hours; but it is well known that the Pulſe are accelerated or retarded from almoſt an infinite Number of Cauſes.

The Day before he enter’d into this Courſe he loſt two Ounces and a half of Blood from the jugular Vein, which had all the Appearances of Health, and when it had ſtood 24 Hours, the Serum was of a deep red Colour, and weighed ʒ 5. gr. xxiiij.

The Pulſe during this Fortnight never exceeded 100 Pulſations in a Minute. The Dog was very briſk and gay, and eat voraciouſly. I could not find that any of the Excretions were increaſed or diminiſh'd.

Aug. 11. Two Ounces and a half of Blood ſeparated ʒvj. gr. x. of Serum, ſomething brighter coloured, than the firſt. The ſame Day I encreaſed the Doſe to half an Ounce of Laurel-Water, mixed in the ſame Quantity of Milk as before.

No material Alteration happen'd during this Fortnight, except that the Pulſe vibrated ſomething more ſmartly than before.

Aug. 25. Two Ounces and a half of Blood ſeparated ʒvj. gr. xxxiij. of Serum of a Burgundy Hue. The Craſſamentum was very florid. The ſame Day I encreaſed the Doſe to ſix Drams of Laurel-Water, and gave it every Morning for a Fortnight, as before.

It ſet perfectly eaſy on his Stomach, and did not diſorder him in any Reſpect, that I could find; neither were the Pulſe accelerated by it ſo much as I expected; they ſeldom exceeding 105 Pulſations in a Minute. The Dog look'd ſleek and well, and grew fat.

Sept. 8. Two Ounces and a half of Blood ſeparated no more than ʒ4. ℈ij. gr. 4. of Serum, which was rather clearer than the laſt, and the Cruor was exceeding florid. The Orifice indeed was made much too ſmall this Time, ſo that the Blood only trickled down the Neck, and was much longer in flowing than at any Time before; but whether this could be the Reaſon of the ſmall Quantity of Serum which this Blood ſeparated in Proportion to the laſt, or whether it was owing to the large Doſes of Lawrel-Water, the ſucceeding Tryals will determine.

In order therefore to know this, I gave an Ounce (Troy) the next Morning; but by Reaſon of the ſtrong Taſte, the Dog refuſed to take it till I had added four Ounces more of Milk; ſo that now he took every Morning one Ounce of Laurel-Water in half a Pint of new Milk.

During this Fortnight the Dog was extremely lively and brisk, he eat heartily, the Excretions by Urine and Stool were regular, he grew fat, his Pulſe beat ſtrong, about 110 Strokes in a Minute.

Sept. 22. Two Ounces and a half of Blood ſeparated ʒvj. ℈ij. of good coloured Serum. Now as this

Blood was let from a large Orifice, and flowed freely, may we not reaſonably conclude that the ſmall Quantity of Serum mentioned above, was owing rather to the ſlow Motion of the Blood from the Vein, than to the Action of the Laurel-Water? For when the Blood flows very ſlowly, and eſpecially when it trickles down, and ſpreads upon the Skin, whereby its Surface is much more expoſed to the free Acceſs of the Air, the ſaline and acid Spirit in it fetters and coagulates the Blood, and proves ſo ſtrong a Copula between ſome of the ſerous and globular Parts, that they remain afterwards in a fix'd State for more than 24 Hours. I have many Times obſerved that the Blood which flows from the Noſe, Drop by Drop, ſeparates but little Serum; and if a ſmall Quantity of

Blood be let into a wide-bottom'd Baſon the ſame Thing happens. Hence this Suppoſition does not ſeem to be without Foundation. But to proceed,

The ſame Day the Doſe was increaſed to ten Drams of Laurel-water, and continued for a Fortnight.

The Pulſe continued ſtrong and regular, and generally beat between 110 and 120 Times in a Minute. In every Reſpect the Dog ſeemed to be in perfect Health.

Oct. 6. Two Ounces and a half of Blood ſeparated ʒvij. gr. vj. of Serum. The fibrous Part was extremely vivid, and much tenderer than before.

The ſame Day I enlarged the Doſe to an Ounce and half.

The Pulſe continued much in the ſame State. The Excretions by

Urine and Stool were regular. The Dog eat voraciouſly, and ſtill grew fat.

Oct. 20. Two Ounces and a half of Blood ſeparated ʒvij. gr. 15. of Serum. There was alſo ſome blackiſh Matter precipitated to the Bottom of the Cup. The Craſſamentum was very florid, and exceeding tender.

The Doſe now being increaſed to two Ounces every Morning, the Dog refuſed to take it any longer in Milk. I therefore boil'd up ſome Oatmeal, and ground Barley in Sheep's-head Broth, 'till it came to a thick Pap, and then mixed the Laurel-Water with near a Pint of it. This generally went down well, and if he happened to refuſe it in the Morning, I never gave him any Thing to eat 'till he had taken his Doſe.

During this Fortnight the Pulſe rarely exceeded 120 Strokes in a Minute, and never arrived to 130. The Appetite continued ſtrong. The Excretions were in good Order. Several Worms began now to come away in almoſt every Stool. They were all alive, and of the *Aſcarides* Kind, except one *Lumbricus latus* which came away dead.

Nov. 3. I encreaſed the Doſe to two Ounces and a half.

The ſame Day two Ounces and a half of Blood ſeparated ℥vj. ℈i. of Serum. The Coagulum was of a beautiful red.

The Dog all this Time continued perfectly well, and the *Aſcarides* kept coming away.

Nov. 10. I increaſed the Doſe to three Ounces, and from this Time forward, as you will find, I added half an Ounce every Week.

The Dog continued taking it very well, he having a voracious Stomach. His Urine began to be a little higher coloured than ordinary, and the Pulſe were ſomething quicker and fuller than before, but he never vomited with it, nor in any other Reſpect, was he diſordered by it, that I could diſcover.

Nov. 17. Two Ounces and a half of Blood ſeparated ʒ 5. gr. 54. of Serum of a deeper Dye than the laſt. There was a good deal of blackiſh Matter ſubſided to the Bottom of the Cup; but the grumous Part ſtill continued of a beautiful vivid Red.

The ſame Day the Doſe was increaſed to three Ounces and a half; and again, *Nov.* 24, I added half an Ounce more.

During

Dnring this Fortnight the Urine was much higher coloured than before. The Dog ſeemed to be dull, and to be more thirſty than uſual; and the Pulſe throbbed vehemently, and felt very hard. I was now forced to add more Pap to the Laurel-water, before I could make him take it, and twice he refuſed it till the next Morning, when he was very hungry; for I never gave him any Thing to eat till he had taken his Doſe. I did not obſerve any *Aſcarides* in all this Time, ſo that probably the Guts were cleared of them. No Tremblings nor Twitchings appeared during the whole Time, but the Dog began now to waſte in Fleſh.

Dec. 1. Two Ounces and a half of Blood ſeparated ʒvj. gr. 15. of Serum. The Coagulum was very tender, with ſome black Powder at the Bottom.

The ſame Day the Doſe was encreaſed to four Ounces and a half; but I could not make him take it above four Times this Week, tho' I mixed it with Milk thickned with Flower, Water-gruel, Mutton-broth, and many other Things, which I thought would tempt him to it. However, I kept him to very ſhort Commons, and *Dec.* 8, I increaſed the Doſe to five Ounces; but this he would not touch 'till he was half ſtarved, and as the Quantity was too much to pretend to force down his Throat, I was obliged to drop the Enquiry, becauſe the Blood would have been ſo much altered merely by faſting in this Manner, that I could not have received any further Light into the Na-

Nature and Properties of Laurel-Water.

From this Experiment we may obſerve what vaſt Difference there is between the Action of the ſame Medicine when poured into the Stomach by itſelf, and when its active, ſubtile, pungent Particles are divided farther from each other by the Intervention of ſome ſmooth, mild, demulcent Matter. It appears alſo from the Whole of this Experiment, that the Blood was rendered more fluid than it was before the Dog began taking the Laurel-water, and that the fibrous Part, after its Separation from the Serum, was extremely florid and tender. I ſhall not, however, pretend to draw many Obſervations from ſo few Experiments.

EXPERIMENT VII.

Aug. 4. 1733. I took two Drams of green Laurel-Leaves, beat as fine as is uſual for a Conſerve, and gave it to a Mongrell Dog 22 Inches high, every Morning for a Fortnight. My Method of giving it was to wrap it up in a Piece of Sheep's or Calve's Bladder, greaſed over with ſome freſh Butter or Lard, which always went down very well.

Before he enter'd this Courſe his Pulſe beat 83, or 84 Times in a Minute, as I counted them for ſeveral Minutes together.

The ſame Day two Ounces and a half of Blood afforded ʒ 5. gr. 50. of dark colour'd Serum. The Craſſamentum looked well, and was pretty tough.

During this Fortnight all Things went well, and the Pulſe beat from 85 to 100 Pulſations in a Minute.

Aug. 18. The Doſe was increaſed to half an Ounce. The ſame Day two Ounces and a half of Blood ſeparated ʒvj. gr. 24. of Serum, almoſt as dark as that before. The Coagulum but little altered. The Pulſe ſomething harder and quicker. The Appetite good, and the Dog in perfect Health.

Sept. 1. Two Ounces and a half of Blood ſeparated ʒvj. ℈ij. of Serum, which was now altered into a beautiful ruby Colour. The grumous Part was very vivid, and of a much looſer Conſiſtence than before.

The ſame Day the Doſe was inlarged to ſix Drams, and given every Morning for a Fortnight.

No remarkable Alteration happen'd during this Time, either in Regard to the Number of Pulſes, their Strength or Fullneſs, neither in the Heat of the Body, the Appetite, Thirſt, nor in any of the Excretions.

Sept. 15. Two Ounces and a half of Blood ſeparated ʒvij. gr. 36. of clear Serum. The Cruor was of a delicate Vermilion Colour, and extremely tender. There was a ſmall Quantity of a duſky red Matter precipitated to the Bottom of the Cup.

The ſame Day the Doſe was increaſed to one Ounce, *Troy*.

During this Fortnight the Dog did not ſeem to thrive quite ſo well as before, tho' as yet he eat as much and as eagerly as ever. His Hair began to ſtand an End; a Varix, about the Size of a Walnut, aroſe upon the Right Shoulder, which continued near a Fortnight, and then ſubſided of its own Accord. The Pulſe were now accelerated to between 120 and 130 Pulſations in a Minute.

Sept. 29. Two Ounces and a half of Blood ſeparated ʒvij. gr. xxv. of Serum. The Gore very ſoft. The ſame Day the Doſe was encreaſed to ten Drams.

The Dog continued to look rough, and to grow lean, tho' his Appetite did not fail him. His Urine was higher coloured than before, and ſeemed very hot, with a great Froth upon it when it fell to the Ground. The Pulſe generally beat about 130 in a Minute.

Oct. 13. Two Ounces and a half of Blood ſeparated ʒvij. gr. 55. of *Burgundy* coloured Serum. The Craſſamentum much tenderer than uſual, and very florid. The ſame Day the Doſe was increaſed to an Ounce and a half.

No material Alteration in this Fortnight, except that one Day he had a large, looſe, green Stool.

Oct. 27. Two Ounces and a half of Blood ſeparated ʒvij. gr. 45. of Serum, which when it firſt began to divide was of a bluiſh Caſt, afterwards it turned duſky, and when I came to weigh it, the next Day, I found a good Deal of black Matter ſubſided to the Bottom. The fibrous Part was much as before. The ſame Day the Doſe was increaſed to one Ounce, ſix Drams.

During this Time three looſe Stools happened, and ſome few *Aſcarides* came away alive, which were the firſt I had ſeen from this Dog. The Pulſe were very full and quick.

Nov. 10. Two Ounces and a half of Blood ſeparated ʒvj. gr. 56. of Serum a little darker than before. The ſame Day the Doſe was encreaſed to two Ounces.

The Pulſe were now exceedingly quicken'd; I counted one Time 157 Pulſations in a Minute. Several looſe Stools during this Time. A Tumour, about the Bigneſs of a Pidgeon's Egg, appeared on the Side of his Head, which being lanced open, diſcharged near three Spoonfuls of green, watery, indigeſted Matter. The Dog continued to grow poor, and to look rough, notwithſtanding all imaginable Care was taken of him.

Nov. 24. Two Ounces and a half of Blood ſeparated ʒvj. ℈ij. of dark coloured Serum, with a good Deal of black Matter at the Bottom. The Craſſamentum was very ſoft and tender, and no Vermilion could poſſibly be of a more lively Colour;

This Day the Doſe was increaſed to two Ounces and a half.

The Dog began to mope and look dull, his Pulſe were very quick, but much weaker than at any Time before. The Urine was now intenſely red, with a yellow Froth upon it, which laſted upon the Graſs ſometime after making.

Dec. 1. The Doſe was increaſed to three Ounces, which he took for ſix or ſeven Days very well, but after that I could not make him take it above once in two or three Days, tho' I contrived ſeveral Ways to cheat him. The Dog was now grown very poor, his Pulſe were extreme quick, the Urine like a Lixivium, the Stools, for the moſt Part, were looſe, and his Appetite very much decayed. This was the State of the Dog when I was obliged to drop the Experiment, not knowing how to proceed to any Purpoſe.

Dec. 15. Two Ounces and a half of Blood ſeparated but ʒ5ſs. of Serum, which, I believe, was partly owing to my not feeding the Dog ſo plentifully as before, in Order make him take the Doſes.

From this Experiment it evidently appears that the Blood was greatly attenuated 'till the Doſe came to be one Ounce, ſix Drams; for *Oct.* 13th we find ʒij. g. 5. and *Oct.* 27th ʒi. gr. 55. of Serum more than what the ſame Quantity of Blood afforded before the Dog began taking the Laurel; which, together with the beautiful, vivid Colour of the Blood, was a vaſt Alteration.

Towards the latter End, indeed, the Elaſticity of the ſeveral Organs ſeemed to decay more and more, from the violent Impulſe of ſo powerful a Doſe. Hence the Strength declined, the Fleſh waſted, and a Tumour aroſe on the Side of the Head, which excited a Fever, his Pulſe beating at that Time, 157 Strokes in a Minute.

I muſt not forget to obſerve that this, and the Dog in the foregoing Experiment, both recovered their Strength, and looked ſleek and well, within a Fortnight after they left off taking the Laurel-water, and Laurel-Leaves.

EXPERIMENT VIII.

A fine, freſh, young Horſe being ſeiz'd with the Glanders, was turn'd into a Salt-Marſh, and neglected 'till the Diſtemper arrived at its greateſt Height, or what the *Farriers* call the Chine-Glanders, which among them is deemed incurable.

The Matter which was diſcharged from his Noſe was very viſcid, yellow, and extremely offenſive. His Blood was exceeding glutinous and foul, and had a Buff-Coat upon it more than half an Inch thick. The Coheſion of the Craſſamentum was ſo ſtrong as to reſiſt the Weight of a Column of Mercury, in a Glaſs Tube, with an obtuſe Point about the Size of a Pea, 13½ Inches high, before the Point of the Tube cut thro'. The Bore of the Tube was ⅓ Inch Diameter. Eight Ounces of this Blood, which was taken from the jugular Vein, ſeparated, after ſtanding 24 Hours, no more than ʒij. gr. x. of yellow Serum.

July 28, 1734. I gave to this Horſe ſix Ounces of Laurel-water, diluted with half a Pint of Spring-water, and repeated it every Morning for eight Days.

Auguſt 5. I increaſed the Doſe to eight Ounces, and continued it for eight Days more.

The ſame Day eight Ounces of Blood afforded ℥i. ʒij. of Serum not quite ſo yellow as before. The Buff-Coat was ⅜ Inch thick. The Coheſion very little alter'd.

Aug. 13. The Doſe was increaſed to twelve Ounces, and repeated every Morning for eight Days.

The ſame Day eight Ounces of Blood ſeparated ℥iſs. of good colour'd Serum. The Buff-Coat was now not above ¼ Inch thick, and gave Way to the Weight of ten Inches of Mercury.

Auguſt 21. The Doſe was increaſed to a Pint, Wine Meaſure, and given every Morning for eight Days, mixed with a Quart of Spring-Water.

The ſame Day eight Ounces of Blood ſeparated ℥i. ʒiiijſs. of dark colour'd Serum. There was now very little or no Appearance of a Buff-Coat, only here and there a bluiſh Speck, or Film. Its Coheſion was equal to 7 ¼ Inches of Mercury.

Aug. 29. Eight Ounces of Blood ſeparated ℥j. ʒvj. of dark coloured Serum. The Gore was exceeding florid, without the leaſt Film upon it, and was now grown ſo tender, that a Column of Mercury four Inches high cut thro' it.

During the whole Time the Horſe appeared very briſk and well, and his Appetite continued good. But as to his Diſtemper, the Running at Noſe increaſed in Quantity, but the Matter was alter'd into a white, well digeſted Pus, without any offenſive Smell, as at firſt.

The Quantity of Laurel-Water which was taken in the whole Time, was 336 Ounces, or 21 Pints.

Here we may properly take Notice of the Fallacy of thoſe Arguments which are drawn from mixing Things with extravaſated Blood, or injecting them immediately into the larger Blood-Veſſels; there being many Things which will coagulate and make the Blood more grumous when applied in this Manner, and yet when adminiſter'd by the Mouth, do thin, rarify, and divide the Blood, perhaps, merely by ſtimulating the Veſſels and accelerating the Motion of the ſeveral Fluids. The Plant before us is an eminent Inſtance of this; for that Laurel-Water does greatly coagulate the Blood, when mixed with it in a Porringer, the following Experiments do ſufficiently teſtify.

EXPERIMENT IX.

To ſix Ounces of Blood extracted from a young Man violently afflicted with an inflammatory Rheumatiſm, I put one Ounce of Laurel-Water, which altered the Craſſamentum into a moſt beautiful vivid Colour, and render'd it ſoft and tender, without a Speck of Size upon it. The Serum was of a light Red, like *Burgundy* Wine, and, after ſtanding 24 Hours, weighed exactly two Ounces.

Six Ounces more of the ſame Blood, being ſaved in another Porringer, by itſelf, appeared very foul and ſizy, with a thick, tough Buff-Coat upon it. The Serum was of a bright Yellow, and weigh'd ℥ij. ʒi. gr. x.

Now if we allow one Ounce of Laurel-Water, which was added to the firſt Porringer, it will appear that ℥i. ʒi. gr. x. of watery Parts were fixed to the globular Parts of the Blood, by the Mediation of the ſtrongly attracting Particles of Laurel-Water.

EXPERIMENT X.

Sixteen Ounces of Blood being drawn from a Woman on the third Day of a pleuritic Fever, I put one Ounce of warm Laurel-Water into a Baſon which received about one half of it. The next Day I found the Blood which was mixed with the Laurel-Water, of a beautiful Colour, the Coagulum exceeding tender, the Serum of a pale red, and in a ſmall Quantity.

The other Parcel of Blood had a Buff-Coat, upon it at leaſt $\frac{1}{3}$ Inch thick; the grumous Part looked very foul and black; the Serum was of a ſtraw Colour, and much more in Quantity than what was in the other Porringer. But this Patient being in the Country, I had not an Opportunity of examining into the exact Proportions.

EXPERIMENT XI.

Half an Ounce of Laurel-Water being mixed with three Ounces of Blood, as it ran from the Arm of a Child ten Years old, and troubled with the St. *Anthony*'s Fire, it preſerved a beautiful Colour, and let go ℥i. ʒiij. of dark coloured Serum.

Whereas ℥iij. ʒvj. gr. 50. of the ſame Blood, in another Cup ſeparated ℥j. ʒj. ℈j. of ſtraw coloured Serum. The fibrous Part had a Coat $\frac{1}{6}$ of an Inch thick, exactly reſembling melted Suet.

EXPERIMENT XII.

An Ounee of Laurel-Water being mixed with ℥6. ʒvj. gr. x. of Blood, as it came from a middle aged Man, on the 2d Day of an acute continual Fever, attended with pungent excruciating Pains in his Head and Back; I found the next Morning no more than ℥j. ℈ij. of dark coloured Serum. The Gore was extremely vivid and ſoft.

℥6. ʒiiij. ℈ij. of the ſame Blood, in another Cup, ſeparated ℥j. ʒ5. ℈ij. of an exceeding yellow bilious Serum. The Craſſamentum had a thin, ſizy Skin upon it, but appeared florid underneath.

I could add a great many more Experiments of this Kind, but as they all exhibited the ſame Phænomena it would be uſeleſs. I ſhall therefore only obſerve, that from theſe Experiments it is evidently demonſtrated, that Laurel-Water has a Power of making great Alterations in the Blood; but whether it performs theſe Effects by altering the Figuration or Bulk of the component Particles of the Blood, or whether it only fixes the ſerous and fibrous Parts together, in ſuch a Manner as not to give the lighteſt Corpuſcles an Opportunity of aſcending to the Top, and by that Means prevents the Formation of the Buff-Coat, ſo uſual in inflammatory Caſes, I ſhall leave to the *Learned* to determine, and ſhall only take Notice, that as the Serum is always alter'd into a *Burgundy* Colour, when Laurel-Water is mixed with the Blood as it flows from the Vein, and not at all when it is put to the Serum only, it evidently follows, that the Tinge is taken from the globular Parts of the Blood. This led me to make the following Experiment.

EXPERIMENT XIII.

I mixed one Ounce of Laurel-water with three Ounces of Serum, from human Blood, which did not in the leaſt alter its Colour nor Conſiſtence, after ſtanding 24 Hours.

I then put it into a Bottle, ſtopt it cloſe up, and ſet it by in a cool Place, where it ſtood upwards of ſix Months without any cadaverous or putrid Smell, neither was there any Mother, or Film at Top, but was very clear and limpid. There was a very ſmall Quantity of whitiſh Matter, ſomething like Salt, ſubſided to the Bottom.

EXPERIMENT XIV.

Half an Ounce of Laurel-water being mixed with one Ounce of Bile taken from the Gall-Bladders of two Dogs as ſoon as they were dead, it had no other Effect than ſo much common Water would have had, by making the Bile more dilute.

It has ſtood in a Bottle, cloſe ſtopt, above a Twelvemonth, and ſmells very ſweet.

EXPERIMENT XV.

Having bled a large Foxhound to Death, by cutting aſunder his jugular Veins, I fixed a Glaſs Tube 4 $\frac{1}{2}$ Feet high to the deſcending Aorta, a little below the Heart, in Imitation of my very ingenious Friend, the Rev. Dr. *Hales* †. I then ſlit open the Guts from End to End, laid Ligatures on the Crural Arteries, and poured into the Tube, by Means of a Funnel, eight Pints, Wine Meaſure, of Blood-warm Water: The firſt Pint ran in as faſt as the Tube would admit it, by Reaſon the large Blood-Veſſels were quite empty. The ſecond Pint was 270″ in paſſing; the third 260″. After this each Pot paſſed ſooner and ſooner, ſo that the eighth Pint run thro' in 75″.

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† *Vide* Hæmaſtatics, N°. ix. xv. xvi. *&c.*

Then I poured in four Pints of Blood-warm Laurel-water; the firſt of which paſſed in 80″, the laſt in 105″.

After this I poured in ſix Pints of cold Laurel-water; the firſt paſſed in 115″, the laſt in 170″.

I then poured in ſix Pints of cold Spring-water; the firſt paſſed in 150″, the laſt in 155″.

Six Pints of hot Water were again poured in; the firſt ran thro' in 145″, the laſt in 80″.

Hence it evidently appears that Laurel-water greatly contracts the lifeleſs Fibres, and how much more they anſwer to any Impulſe when animated, every one who is acquainted with the Animal Oeconomy muſt needs underſtand. I proceed now to relate two or three Ex-

Experiments made with Laurel-water upon the Outſide of the Body.

EXPERIMENT XVI.

I dropt from ſix to ten Drops of Laurel-water into the Eye of a Dog, for a great many Days together, which gave him no more Uneaſineſs than ſo much cold Spring-Water did in the other Eye.

Hence it appears that Laurel-water is not very acrid, ſharp, or corroſive, ſince it creates little or no Pain when outwardly applied to ſo tender a Part of the Body. From whence thoſe excruciating Pains ariſe when inwardly given, requires further Reſearches to diſcover.

EXPERIMENT XVII.

Obſerving ſome eſſential Oil to be ſunk to the Bottom of a Bottle of Laurel-water, I poured off the Water as near as I could, and then ſhook the Bottle 'till the Mixture of Oil and Water looked white; of this I dropt ſix Drops into each Eye of a Dog, which ſeem'd, by his rubbing his Eyes, to put him to a good deal of Pain; however, it was not above ſix Minutes before he looked up as well as ever. His Eyes water'd a little afterwards; but no Inflammation, or any other Diſorder, ſucceeded it.

EXPERIMENT XVIII.

I cut out a Piece of the Skin, about the Breadth of a Shilling, juſt behind the Ear of a Dog, that he might not be able to lick it, and then dreſſed it every Day with a Pledget dipt in Laurel-Water. The Wound always look'd well, and healed up as ſoon as is common.

EXPERIMENT XIX.

I dropt ſome Oil of Vitriol into Laurel-water without any Efferveſcence or Ebullition.

In like Manner I tried it with Oil of Tartar *per Deliquium*, and the Mixture lay as quiet as before.

Hence it may be juſtly inferred, that Laurel-Water is neither acid nor alkaline.

Thus I have barely but faithfully related the Reſult of theſe Experiments, and am inclined to think ſome further Uſe might be made of them, ſince, from all the Phænomena,

nomena, it appears that Laurel is capable of producing ſurprizing Effects in an animal Machine.

By a Series of Experiments, and a long Experience of the good or bad Qualities of any Drug upon Brutes, we may inveſtigate, in a great Meaſure, its Nature, and what Effects it is likely to produce in human Bodies; which to determine expreſly *à priori*, ſeems inſuperable to our Underſtanding. I don't doubt but glorious Diſcoveries might be made, if ſome knowing, curious, and experimenting Perſons were appointed by the Public, for this Purpoſe, and had Liberty of repeating their Experiments upon Malefactors, with ſuch Plants whoſe Efficacy and Safety they had often tried before-hand upon Brutes.

Conſidering how ineffectual many of our common and known

Remedies are in ſome Diſeaſes, "I "eſteem, with the noble *Boyle*, "the diſcovering and divulging "uſeful Things in Phyſic, and the "recommending good Remedies, "among the moſt extenſive Acts "of Charity, whereby a Man be- "comes, really, more ſerviceable "to the World than by building "an Hoſpital." And as the beſt Remedies, for chronical Diſeaſes eſpecially, are to be ſought after among the moſt active and pungent Drugs, ſuch as are endued with ſubtile, ſulphureous, and ſaline Particles, or ſuch as in large Doſes, or without proper Management may be deem'd poiſonous; it follows that whoever is ſo happy as to diſcover a Method of converting ſuch Things into ſafe and uſeful Medicines, will greatly advance the Art of Medicine, and will be enabled thereby to cure ſuch Diſeaſes, as others would be apt to judge incurable.

I have lately been told that the Powder of dried Laurel-leaves is much uſed in my Neighbourhood, as a certain Cure for an Ague, by giving as much of it as will lie on a Shilling, in a Glaſs of White-wine, two Hours before the Fit, and repeating it three Times. It is held in great Eſteem among the poorer Sort of People, and is ſaid to have good Succeſs.

Another Remedy I have lately been told of, and which may indeed produce great Alterations in the Blood and Juices, as being a very pungent poiſonous Herb, is the *Cotula fœtida*, or *May-Weed*, as a Sovereign Cure for the Rheumatiſm. A poor Man had long labour'd under this Diſtemper, and indeed had quite loſt the Uſe of his Limbs, when a travelling Woman came to his Door and told him of this Remedy, *viz.* to boil a Handful of May-weed in a Quart of Ale till it came to a Pint, then to ſweeten it with Treacle, and to take it all at Night going to Bed. But it being ſo very nauſeous he could not get down above half the Doſe, which, however, threw him into a moſt profuſe Sweat, and gave him ſo much Eaſe that he ventured upon the remaining Part the next Night, which reſtored him to the Uſe of his Limbs.

This Account of the Effects of the *Cotula fœtida* is well atteſted; but as it is a ſingle Inſtance, no Dependance can be made on it without farther Trials, which I ſhould be heartily glad to ſee done on the Bodies of *Convicts*, in order to bring this and a thouſand other Plants into common Practice, whoſe Virtues we know nothing of at preſent.

The Pleaſure, Variety, and Uſefulneſs, that attend theſe Sort of Experimental Enquiries have happily brought them into great Credit and Repute. We have a large and beautiful Scene already opened to our View; and whoever endeavours to cultivate or enlarge it will be ſure to be recompenced for his Pains. One Experiment oftentimes ſuggeſts other Enquiries little thought of before, which together with the Inferences and Applications to be made, lead us inſenſibly on; and it not unfrequently happens, that even when we obtain not what we ſeek, we find ſomething as valuable: So fruitful is Nature, that induſtrious Reſearches will evermore be rewarded with ample Diſcoveries!

Upon a Review of the whole; theſe Experiments may poſſibly amuſe ſome, and, perhaps, excite others to purſue this Method of enquiring into the Nature of ſuch Plants which we dare not, as yet, make uſe of in Phyſic. For my Part, I intend, at my leiſure Hours, to proſecute theſe Sort of Experiments a little further, and hope, in Time, to deduce ſome practical and uſeful Inferences from them.

EXPERIMENTS

WITH

SULPHUR.

Read before the ROYAL SOCIETY
in 1745.

EXPERIMENTS

WITH THE

FUMES of SULPHUR:

Shewing by what Means they deſtroy an Animal Body.

EXPERIMENT I.

SULPHUR being a Principle whereby many amazing and wonderful Phænomena are produced, I thought it worth while to try what Effects its Fumes would have on Animals, when applied to different Parts of their Bodies.

We are already well aſſured from innumerable Experiments, that if ſulphureous Steams are admitted in any Quantity, into the Lungs, they ſoon extinguiſh Life; but whether they will produce ſuch fatal Effects, or what Phænomena they will occaſion when applied to other Parts of the Body, without being ſucked into the Lungs, has not been experimented that I know of.

I therefore took a middle-ſized Spaniel Dog, and put him into a Deal Box which juſt fitted him; at one End of the Box I made a Hole large enough for his Head to come through, and then glewed and nailed a Strip of Leather about four Inches broad, all round the Hole, which being afterward gathered up by a String, and tied faſt round the Neck of the Dog, it hinder'd him from pulling back his

Head into the Box, and effectually prevented the ſulphureous Fumes from eſcaping by the Sides of his Neck.

In the next Place I cut a Hole, three Inches Diameter, in the Bottom of the Box, and exactly fitted to it the Leg of an old Jack-Boot, which ſerved as a Funnel to convey the Fumes into the Box. The Box was alſo cloſely cemented at every Joint.

After this I cut a Hole through a Pannel of Wainſcott into another Room, and fixed the Box up to it, ſo that the Head of the Dog went alſo through the Hole in the Wainſcott into the other Room, by which Means thoſe ſulphureous Fumes which did not fly up into the Box, could not well arrive at the Noſe of the Dog to annoy his Reſpiration.

Things being thus prepared, I ſet Fire to a Wad of Tow, which had been dipt into melted Brimſtone, and put it up the Tunnel. When one Match was burnt out, I took another, and ſo kept on till more than half a Pound of Brimſtone was conſumed.

The Dog expreſſed no Manner of Uneaſineſs for a good while, and at laſt, he only panted, lolled out his Tongue, and drivell'd as though he had run hard, and all this merely from the Heat of the Fumes.

When I open'd the Box a thick Cloud of ſulphureous Fumes flew out, though it was near a quarter of an Hour after I had left off burning the Matches. The Dog immediately leaped out of the Box, ſhook himſelf briſkly, and ſeemed in no Ways diſordered by this Experiment.

Upon looking into the Box, after it was clear of the Fumes, I found a great Number of dead Fleas.

Hence it is evident that the ſulphureous Fumes were not capable of pervading the Skin of the Dog, or producing any bad Effects, except on the Fleas which were obliged to reſpire in them.

EXPERIMENT II.

The next Day I cut aſunder the Windpipe of the ſame Dog, and having ſtopt up that Part of it next his Head, with a Cork, I thruſt his Head into the abovemention'd Box, and kept his Body out. The leathern Collar was tied cloſe round his Neck, above the Place where his Windpipe was cut, ſo that no Fumes could poſſibly reach the Lungs.

I then lighted Brimſtone Matches, and put them up the Funnel as before. The Dog expreſſed a vaſt Deal of Uneaſineſs juſt at firſt, and plunged much; but afterwards he lay ſtill, breathed regularly, and his Pulſe beat ſtrong and quick, notwithſtanding I burnt as much Brimſtone in this as in the former Experiment.

The Dog being releaſed, his Eyes appeared all over of a cloudy Pearl-Colour; the Coats were much thickned and hardened, ſo that he was quite blind. The Humours of the Eye, as far as I could perceive upon letting them out, were not in the leaſt altered. The Roof of the Mouth, and Tongue looked white and ſhrivelled, and a good deal of frothy, viſcid Matter hung about them. The Dog was ſomething

thing ſtupid, but he had the free Uſe of every Limb.

Here we have plain Demonſtration of a violent Stimulus from the groſſer Parts of the ſulphureous Fumes, which excited pungent Pains, and contracted, or thickened the Coats of the Eyes to a very great Degree; but it is as evident that the moſt ſubtile Parts of the Sulphur either had no Admittance into the Brain and Nerves, or that they were not capable of arreſting the animal Spirits ſo as to deſtroy muſcular Motion.

EXPERIMENT III.

Having procured a Tin-Tube two Foot long, and three Inches Bore, I fitted one End of it to the Hole in the Bottom of a Pair of Bellows, by Means of a hollow Piece of

Wood turned round, and nailed on to the Bellows for that Purpoſe. I then tied to the Noſe of the Bellows a Sheep's Bladder, and to the End of the Bladder a Clyſter-pipe, which being introduced into the Anus of a Dog, I ordered an Aſſiſtant to light a Brimſtone Match, and to put it up into the Tin Tube, whilſt another Aſſiſtant held the Dog ſteady, and I myſelf blowed with the Bellows.

By this Contrivance we propelled the ſulphureous Fumes into the Bowels in great Plenty, 'till they forced back in ſuch Abundance, that we were not able to ſtand our Ground.

The Dog being let looſe, immediately diſcharged a good Deal of Urine, and ſome *Fæces alvinæ*. He ſeemed very uneaſy, and run about the Garden as tho' ſome Oil of Turpentine had been injected. He had frequent Motions to Stool, but voided little or nothing; and in half an Hour's Time he had a Teneſmus with violent Strainings, which brought on, in a ſmall Degree, a *Prolapſus Ani.*

The next Morning he ſeemed to be in a good Deal of Pain, with frequent Inclinations to Stool; and what was now voided conſiſted of a ſlimy, mucous Matter intermixed with Blood.

The Stools continued in this Manner for five or ſix Days, after which the Dog perfectly recovered.

Here again we may obſerved a violent Stimulus from the groſſer Parts of the ſulphureous Fumes, which irritated the Inteſtines to a Diſcharge of a deal of mucous, bloody Matter; but we may reaſonably conclude, notwithſtanding the abſorbent Veſſels are infinitely numerous in the Bowels, and the Extremities of the Nerves are very much expoſed there, that the moſt ſubtile Parts of the Sulphur did not pervade them, or that they were not capable of coagulating the Blood, or deſtroying Elaſticity of the Animal Spirits; ſince the Dog recovered ſo ſoon, and ſince he never loſt the Uſe of any Part.

EXPERIMENT IV.

I perforated the Abdomen of a Dog with an Inciſion Knife large enough for the above-mentioned Clyſter-pipe to follow, and the Apparatus being prepared, as before, I forced the ſulphureous Fumes into the Cavity of the Abdomen till it was greatly diſtended.

The Dog expreſſed a vaſt deal of Pain whilſt the Fumes were entering, and continued very dull, and refuſed to eat all that Day; but no Paralyſis, or Loſs of Motion happened in any Part.

The next Day the Dog appeared very briſk, he eat heartily, and ſeemed as if nothing ailed him.

EXPERIMENT V.

Four or five Days afterwards I opened the Thorax of the ſame Dog, between the ſeventh and the eighth Ribs, reckoning from below, and inſerted the abovementioned Clyſter-pipe into the Inciſion. I I then ſtitched up the Wound cloſe round the Pipe, ſo that no Air could enter the Cavity of the Thorax but what muſt firſt paſs through the Tin Tube, Bellows, and Clyſter-pipe; and when the ſulphureous Fumes were forced in, they could not eaſily eſcape out of the Wound.

The Dog complained but little while this was doing, but the Moment the Brimſtone Match was lighted and put up the Tube, even before I began blowing with the Bellows, ſome of the Fumes were ſucked in by the alternate Dilatation and Contraction of the Cavity of the Thorax, which put the Dog to exquiſite Pain, and made him roar hideouſly.

All the while I was propelling the ſulphurous Fumes into the Cavity of the Thorax, the Dog was in extreme Pain, and foamed very much at the Mouth. And towards the latter End of the Time, which was about three Minutes, he breathed with great Difficulty, by Reaſon, I pre-

I preſume, of the vaſt Stimulus on the Pleura and intercoſtal Muſcles, and becauſe one half of the Lungs was collapſed from the Preſſure of the Air on their external Surface. Add to this, that as the Circulation of the Blood was certainly obſtructed in one half of the Lungs, its Velocity muſt be very much increaſed in the other; ſo that in all Probability, it kept them in a State of Diſtenſion by the mere Impetus of the Blood, as is uſual in violent Strainings, and Exerciſe. From both which Cauſes Reſpiration muſt needs be performed with the utmoſt Difficulty.

But as the increaſed Velocity of the Blood through one half of the Lungs, did not compenſate for the Obſtruction in the other Part, ſo the Blood was accumulated in the larger Veins for Want of a freer

Paſſage through the Lungs; whence the Pulſe became low and ſlow, and continued to be ſo for ſix or eight Hours after the Operation. That is, when the Wound was cloſed up, ſo that no Air could enter from without, into the Cavity of the Thorax, the Air which was pent up, began to be abſorbed by the *Vaſa inhalantia*; and as that Air was ſucked up, or waſted, the Lobes of the Lungs which were quite collapſed before, began to play again, and continued to do ſo more and more, 'till they came to their full Degree of Expanſion, or till all the ſuperabundant Air in the Cavity of the Thorax was abſorbed, which, by the Pulſe, appeared to be ſo the next Day.

When the Dog was firſt let looſe, he ran from Place to Place, and was in great Pain for about an Hour; but after that, he laid himſelf down upon ſome Straw, and ſeem'd to be pretty eaſy the remaining Part of the Day.

The next Morning he looked briſk and lively, but upon the leaſt Motion he was ſeized with a weak tickling Cough, which ſeemed very uneaſy to him, by Reaſon of the extreme Soreneſs of one half of his Cheſt.

The Soreneſs and Cough continued eight or ten Days, and then the Dog appeared to be perfectly well.

EXPERIMENT VII.

Seeing that ſulphureous Fumes produced no dangerous Effects when propelled into the Cavity of the Abdomen, or into the Cavity of the Thorax, upon both the Superficies of the Inteſtines, and upon the outward Superficies of the Lungs; I thought it would not be uſeleſs to try if ſtrongly compreſſing the ſulphureous Air into the Lungs would in any wiſe retard or prevent Death, by forcibly dilating the Veſicles, and thereby procuring a Paſſage for the Blood.

I therefore cut aſunder the Windpipe of a Dog, and adapted to it a little wooden Tube, to which the Bladder, Bellows, and Tin Tube were fixed as they were before to a Clyſter-pipe. Through theſe I impelled ſulphureous Air into the Lungs in ſuch a Manner as greatly expanded them at every Compreſſion of the Bellows, which was ſomething quicker than Reſpiration is commonly performed. But notwithſtanding this additional Force, the Dog died in 45 Seconds. Hence we may deduce the following Inferences.

Firſt, That merely dilating the Lungs with groſs Air is not ſufficient to maintain Life; becauſe the Lungs were oftner, and more forcibly expanded in this Experiment, than they were before in ordinary Reſpiration.

Secondly, Since upon opening the Thorax of this Dog, the Blood in the Pulmonary Veſſels did not ſeem to be coagulated; and ſince it is evident from EXP. III. IV. and V. where both the internal and external Superficies of the Bowels, together with all the meſenteric Blood-Veſſels, the Stomach, Liver, Spleen, Diaphragm, Pleura, Mediaſtinum, and the external Superficies of the Lungs were much more fumigated, than the internal Surface of the Lungs was in this Experiment, and yet no Obſtructions or dangerous Inflammations aroſe from thence; I ſay, conſidering all theſe Things, we may reaſonably conclude that the acid coagulating Principle of the Sulphur was not the Occaſion of this ſudden Death. It muſt be confeſſed indeed, that the Blood-Veſſels in the Lungs were more expoſed to the ſulphureous Fumes, and it is probable they might more eaſily pervade the Extremities or Sides of the delicate fine Blood-Veſſels there than in any other Part of the Body; but as the Lungs were free from Obſtructions, as far as I could perceive, and as the Blood flowed freely from the capillary Veſſels upon cutting off the Tips of the Lobes; I am humbly of Opinion that the Death of the Dog did not proceed from any Obſtructions or Coagulations in the Arteriolæ, or ultimate Branches of the Blood-Veſſels.

Thirdly, Since the ſulphureous Fumes did not deſtroy Animal Motion, when applied to the Sides and Extremities of all the Nerves which were expoſed in the Cavities of the Thorax and Abdomen, it is not reaſonable to think that this ſudden Death could be owing to any particular Influence of the ſulphureous Fumes on the Nerves in the Lungs.

Fourthly, Hence it evidently appears that ſince the Fumes of burning Brimſtone do not occaſion Death by their immediate Effect on the Fibres or Juices of the Body, they muſt do it by deſtroying ſome ſubtile, ætherial, vital Matter in the

Air, which is eſſentially neceſſary towards preſerving Animal Motion, and without which Life cannot ſubſiſt but a few Moments.

The ill Effects of burning Charcoal in a little cloſe Room, proceed from the ſame Cauſe, and not from any Influence it has of itſelf on an Animal Body.

The Rev. Dr. *Hales*, in his *Analyſis of the Air*, has ſufficiently ſhewed that Sulphur is endued with a ſtrongly attracting Power, whereby its Fumes are capable of deſtroying the elaſtic Property of Air. And indeed it was from the ſame ingenious *Gentleman* that I received the firſt Hint of making theſe Experiments with Sulphur, in Order to try whether its Fumes would fix or deſtroy the Elaſticity of the Animal Spirits, and thereby prevent muſcular Motion, when applied to any other Part of the Body beſides the Lungs.

Sir *Iſaac Newton, in his Opticks*, Qu. 24. ſuppoſes that Animal Motion may be performed by an ætherial Medium exceedingly more rare and ſubtile than the Air, and exceedingly more elaſtic and active. And indeed the Inſtant Death that oftentimes happens from a Flaſh of Lightning ſeems to be owing to the Deſtruction of ſome ſuch ætherial Medium. For though it appears from the above Experiments, that the Steam of common Sulphur when ſet on Fire, is too groſs to pervade the Veſſels, even when applied to the moſt delicate Parts of the Body, or if it does pervade them it is not mortal, but when it affects the Air in Reſpiration; yet the Particles of Lightning may probably be ſo exceeding minute, and ſtrongly attracting, as to paſs through every Nerve, and fix the Animal Spirits at once.

I cannot think that Lightning kills merely by wounding the Fibres of the Body, or by affecting the Air like common Sulphur, though it oftentimes ſmells ſo ſtrongly of it; or that the mere Collapſion of the Lungs from a Vacuum, which may be ſuppoſed to be occaſioned by Lightning, could be ſufficient to kill, when the circumambient Air ſo immediately flies in to reſtore the Equilibrium, and to dilate the Lungs, if the Diaphragm, intercoſtal Muſcles, *&c.* were not rendered motionleſs by the Action of the moſt ſubtile, ſtrongly attracting Particles of Lightning.

We find that Animals put into the Receiver of an Air-pump, may be made ſenſeleſs by exhauſting the Air, and brought to again by readmitting it, as often as we pleaſe. And certainly the inſtant Return of the Air after a Flaſh of Lightning would do the ſame Thing was not the vital Spirit of the Body fixed or deſtroyed in ſuch a Manner, that no Compreſſion or Force applied to the Lungs afterwards, is able to ſet the animal Machine in Motion again. But as to the Truth of theſe Conjectures, we muſt depend upon a greater Number of accurate and well grounded Experiments to aſcertain it.

EXPERIMENT VII.

Having ſufficiently ſeen the Effects of ſulphureous Fumes on the external and internal Superficies of the Body, I was willing to purſue the Inquiry a little further, by trying what Phænomena they would produce when injected into the Blood-Veſſels; and accordingly I endeavoured to force them into the carotid and crural Arteries of a large Dog, but in vain, becauſe of ſome Inoſculations of the Arteries, whereby the Blood flowed back with a great Force, and roſe up into the Tube ſo as to hinder the Experiment. However, I afterwards inſerted a ſmall Blow-pipe into the jugular Vein, and having fixed to it a very ſmall Pair of Bellows, deſigned at firſt for a Child's Play-Thing, with a Tin Tube at the Bottom, as in Exp. III. I propelled the ſulphureous Air towards the Heart, 'till the Dog died, which was in the Space of eight Strokes, or eight Times blowing with the Bellows.

Upon opening the Thorax, I found the right Auricle and Ventricle of the Heart greatly diſtended with Air, and but little Blood in them. The left Auricle and Ventricle were collapſed. The Blood in the Pulmonary Artery and Vein was bright and florid, and flowed out freely upon opening them. I could not perceive any Obſtructions or Coagulations of Blood in any of the Veſſels, except a ſmall grumous Concretion a little below the Inſertion of the Blow-pipe in the Jugular Vein.

Hence I was induced to believe that the Death of the Dog was owing to the Reſiſtance which the Air gave to the Return of the Blood through both the *Vena Cava*'s, and not to any particular Action of the ſulphureous Fumes on the Blood itſelf. And accordingly,

EXPERIMENT VIII.

I blowed juſt as much pure Air into the jugular Vein of another Dog, which killed him as ſuddenly, as that which was mixed with ſulphureous Fumes.

May we not from hence reaſonably ſuppoſe that many Obſtructions ariſe from Air being pent up in the capillary Veſſels, ſo as to reſiſt the Circulation of the Blood and Juices through them?

And may we not alſo ſuppoſe that if groſs Air was admitted into the Blood through the Pores of the pulmonary Membranes, it would ſoon overcome the vital Powers of the ſeveral Organs of the Body, and put a Stop to all Motion?

FINIS.